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Enhancing the Streetscape of Sidewalks for Sustainability and Liveability in Shared Streets

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Abstract: The urgent call for resilient, sustainable cities took place in promoting sustainable development to be achieved by 2030, especially in Egypt's agenda, and meeting users' needs through safe and affordable public spaces and inclusive and sustainable urbanization. Open public spaces in sustainable cities act as a source for enhancing interaction between users, including city and neighborhood streets and sidewalks, squares, parks, and other shared spaces such as private parks, in addition to enhancing well-being and good quality of life. In the last couple of years, the use of vehicles and transportation has become a burden for users to use sidewalks, access open spaces, and access outdoor areas, which need an urgent response by decision-makers and stakeholders. As a result, new approaches are currently taking place as a scheme for reforming sidewalks, especially in shared streets, in order to act as a public space for interaction, commuting, and new activities to increase its liveability. Sidewalks act as a place for safe socialization, communication, and commuting through walking and cycling. The research methodology focuses on three stages, including theoretical, analytical, and empirical studies. The theoretical phase presents a theoretical background for the topic. The analytical phase focuses on global cases and guidelines. The empirical phase tests the applicability of the suggested guidelines derived from the theoretical and analytical phases. Finally, the research's main objective is to examine the applicability of achieving the liveability and sustainability of sidewalks in shared streets in cities as a quick and effective public space for wellness that can be adopted in megacities, with special reference to the Al-Khalifa neighborhood in Egypt.

Keywords: sustainability, liveability, urban streets, pedestrian-friendly, sidewalk activities, walkability

1. Introduction

Cities started to suffer from the increase in population and vehicle usage, especially 50 years ago, as 2014 was marked as the year in which more than 54% of the world's population lived in urban areas [1]. As a result, urbanization became a burden for the existence of some services in cities, such as the shortage of open public spaces, the lack of amenities and services, the shortage of resources such as water, food and electricity, and the dearth of green areas. Therefore, social interaction between residents started to be affected due to the shortage of public spaces and places for users to interact. Accordingly, people started to have mental illness issues and get depressed due to the decrease in social activities and individual activities such as walking in parks and using public spaces due to the isolation, especially during the pandemic. As a result, researchers and stakeholders started to focus on finding alternatives for facing those

problems, such as enhancing streets and making new prototypes for people to interact through open public spaces and outdoor areas [2, 3]. Concerning megacities, there is an urgent need to make them more walkable with appropriate sidewalks to enhance interaction by creating appropriate activities and suitable amenities. Moreover, it results in the urgent need for fourth-generation cities that have suitable infrastructure that could meet those population needs, including streetscape elements. Therefore, sustainable cities' goal depends on improving cities through many targets, including safe and affordable public spaces, affordable and sustainable transport systems, and inclusive and sustainable urbanization [4].

As a result, sustainable sidewalks in cities became one of the approaches that achieved these targets, especially in the post-pandemic era in megacities, due to the lack of communication and restrictions applied as social distancing affected inhabitants' interaction [1, 5-8]. Accordingly, the research presents guidelines for achieving liveable and sustainable sidewalks to enhance commuters' interaction in residential neighborhoods and enhance streetscape elements for wellness.

2. Research methodology

The research is based on three phases of study: the theoretical, the analytical, and the empirical phases, as shown in Figure 1.

Research methodology		
Literature review	Analytical study	Empirical study
Sustainable sidewalks	Case study analysis	Local case study analysis
Conclusion: Enhancing sidewalk sustainability guidelines		

Figure 1. A chart illustrating the research methodology

The theoretical phase discusses background information about sidewalks and this field of study. Then, the analytical phase focused on reviewing international case studies that successfully achieved sustainability in sidewalk design in different contexts through the collective presentation of different case studies. As a result, the analytical phase reached guidelines and developed a framework for applying them in the local case. Then, the applied phase started by choosing the case study based on a neighborhood that achieved a strategy for implementing the intervention in its sidewalks, in parallel to the urban survey work, and based on choosing a case with available data through observation and questionnaire.

The paper then reviewed the situation in the case study in Cairo and analyzed it. Afterwards, the researcher conducted a pilot study with a focus group in the selected area of the study that included a questionnaire to measure and assess user preferences for utilizing the abandoned sidewalks in the neighborhood. Then, the applied study ended by analyzing the data to reach recommendations for enhancing sustainability and liveability. The research focused on Al-Hattaba spaces in Al-Khalifa district through an online questionnaire due to limited resources and time. Due to time and cost constraints, the focus was limited to a randomly selected sample of 12 people (residents and passengers) to estimate the user population. Moreover, the assessment is limited to the field study done between 2015 and 2021.

3. Enhancing the streetscape of sidewalks

3.1 Streetscape elements

The first known use of streetscape was in 1924, when it was defined as “the visual elements of a street, including the road, adjoining buildings, sidewalks, street furniture, trees, open spaces, etc., that combine to form the street’s

character” [9]. Streets are the elements that every user is exposed to and that have an impact on them, whether these streets give them comfort or make them feel unsafe, welcome or unwelcome. In addition to this, streetscape design affects users’ perception of feeling safe or not, so each streetscape must be functional, provide for the needs of users, and be designed for the comfort and safety of all: pedestrians, drivers, strollers, and street cafés. Therefore, the streetscape could influence user behavior by encouraging the use of cars or walking. This effect could serve as a guide for designers to determine their design priorities; consequently, some cities adopted the approach of prioritizing pedestrians through streetscape elements. As a result, street policies could enhance commuters’ safety while also enhancing the livability of streets by fostering social interaction and making them more pleasant.

3.2 Streetscape of sidewalks

The sidewalk acts as a path for pedestrians and commuters on the street side. While designers can enhance the built environment through the design process, street lanes are divided into sidewalks, a lane for bikes, and a lane for cars. As a result, good design enhances a good lifestyle in a friendly environment. A good environment encourages cycling, using public and active transport, and walking [10]. Therefore, sidewalks will be discussed in this section, including definitions and a few sustainability assessment tools that enhance the formulation of the guidelines.

A wide range of indicator tools appeared in the last few years; some of these tools focused on European cities, such as the European Environmental Agency (EEA) Urban Metabolism Framework, the European Green Capital Award, the European Green City Index, the Reference Framework for Sustainable Cities, the Urban Ecosystem Europe, and the Urban Sustainability Indicator. Meanwhile, some other tools, like the Global City Indicators Program and Indicators for Sustainability, are based outside Europe. These include Leadership in Energy and Environmental Design (LEED) and the Sustainable Sites Initiative. Moreover, other frameworks were developed during the last few years, such as Building Research Establishment Environmental Assessment Method (BREEAM) Communities in the United Kingdom, Comprehensive Assessment System for Built Environment Efficiency for Urban Development (CASBEE-UD) in Japan, Sustainability Tools for Assessing and Rating (STAR) Communities, the Eco2 Cities Initiative, and Green Star Communities. Moreover, systems focusing on sustainable infrastructure appeared, such as Envision in the United States, the Infrastructure Sustainable Rating Tool in Australia, and Civil Engineering Environmental Quality in the United Kingdom [11]. On the local level in Egypt, the Green Pyramid rating system started to take place recently and focuses on achieving sustainability goals. In addition to this, cities such as Brazil have started to put some guidelines in place for achieving livability and sustainability in sidewalk design.

3.3 Streetscape of sidewalks as a tool for sustainability

Streets perform certain basic functions in the built environment, such as providing routes for vehicles and public transport and accommodating utility services and drainage systems. The design of a street affects how successful it is in performing these functions, and it can vitally affect the urban character of a neighborhood and influence how people use the street and interact with each other on it. The quality of the street and downtown areas and their connections can affect whether people choose to walk, cycle, or take the car, which affects the achievement of sustainability goals as it acts as a social aspect of sustainability. In addition to this, it can affect whether people feel safe or not while walking and using the streets. These transiting spaces can be a reflection of the social, economic, and historical characteristics of the city as they act as catalysts for social interaction, not only for commuting from starting point to destination. Streets are not only designed for pedestrians and motor vehicles, but they also act as a public space for people, where they walk, shop, meet and participate in activities for living [12]. These activities could be explained by explaining street elements [13]:

- Carriageway (or street pavement): The area of a street reserve that is provided for the movement or parking of vehicles, measured from curb to opposite curb.
- Street reserve: The land set aside for a street carriageway and verge, incorporating the full width from the property line to the opposite property line.
- Travel way: The part of the carriageway that is used for vehicle travel and does not include the area normally used for parking.
- Verge: That part of the street reserve between the carriageway and the boundary of adjacent lots (or other limit

to the street reserve). It may accommodate public utilities, footpaths, stormwater flows, street lighting poles and landscaping.

The interaction between people and public space is affected by physical aspects of the space, including aesthetics and furniture, and some social aspects, such as safety and accessibility. Concerning safety, Egypt lacks safe streetscape elements, which affect user behavior and the quality of spaces, as a quarter of the number of road injuries are pedestrians, according to the World Health Organization in 2008, and 2016, the road death percentage is also increasing [14]. As a result, achieving sustainable and safe streets decreases road injuries and increases people's interaction, which enhances walkability.

As stated by Forsyth [15], in defining the term walkability, "some discussions of walkability focus on the means or conditions by which walking is enabled, including areas being traversable, compact, physically appealing, or safe. Others propose that walkability is about the outcomes or performance of such walkable environments, such as making places lively and sociable, enhancing transportation options, or inducing exercise. A final set of discussions uses the term walkability as a proxy for better urban places, with some paying attention to walkability being multidimensional and measurable and others proposing that enhancing walkability provides a holistic solution to a variety of urban problems" [13, 15]. These urban problems include social isolation and declining social interaction between people. As a result, the next section of the research investigates the applicability of enhancing sidewalks to face some urban problems on a global scale.

4. Enhancing sidewalks for livability and sustainability

The approach to enhancing sidewalks is not new, but it has developed in the last few decades. Jane Jacobs, in her theories since 1960, focused on activating sidewalks by making eyes on the street [16, 17]. Eyes on the street mean that if an area is utilized for different purposes, there will always be someone keeping a passive watch and policing it the whole day, which means it would be safe for commuters and users; those eyes could be a homemaker, shopkeeper, pedestrian, peddler, street vendor, or office worker [18]. Those theories have been developed by different designers and architects that emphasize that walking and using sidewalks means that fewer motor vehicles will be used, reducing transport emissions and enhancing individual health. As a result, more people walking means safer streets and more activities, in addition to enhancing positive urban coexistence. Sidewalks' importance became one of the issues that tackled the urban design field in the past couple of years, especially after the pandemic. Therefore, many cities started to formulate guidelines and principles for enhancing the livability and sustainability of sidewalks to promote more active-livable cities, including proper sizing, universal accessibility, safe connections, clear signage, attractive spaces, security, quality surfaces, and efficient drainage, as shown in Figure 2.

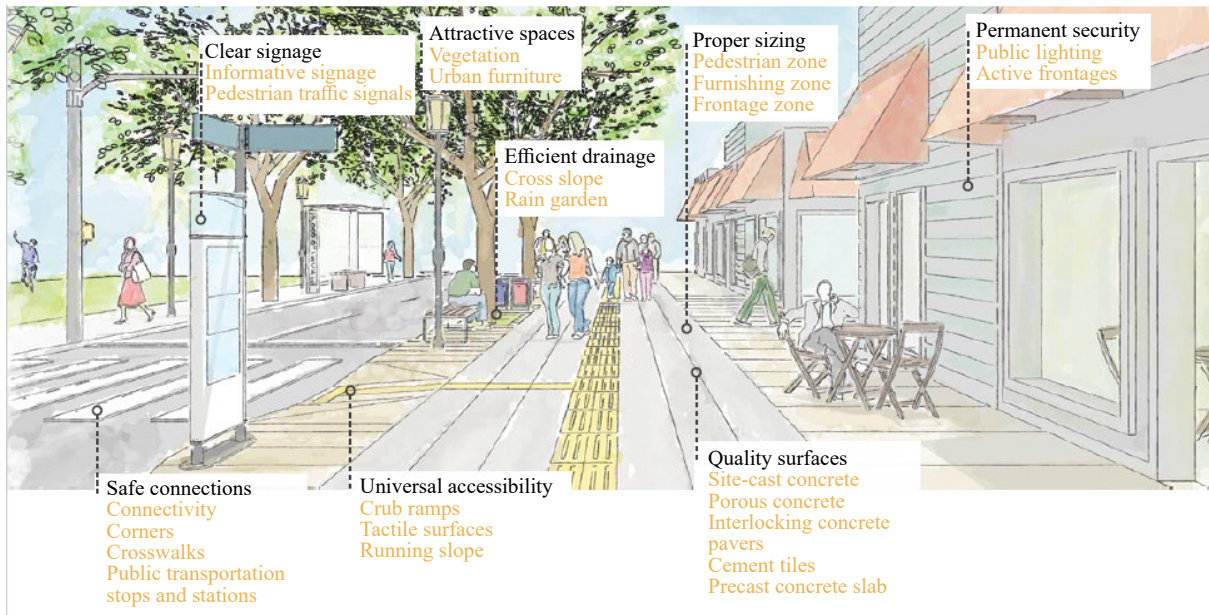


Figure 2. The principles of sustainable and livable sidewalks [19]

First, proper sizing includes furnishing zones, pedestrian zones, and frontage zones; as they provide enough space for users to engage in different activities, including walking, socializing, and accessing buildings. The sidewalk furnishing includes benches and trees, while the pedestrian zone is made to facilitate walking with no obstacles. Meanwhile, the frontage zone includes the furniture of commercial establishments without interfering with commuters. Second, universal accessibility focuses on tactile surfaces, low-angle running slopes, and curb ramp design to allow every user access to an urban space. Sidewalks should be accessible to different types of users, which include children, the elderly, people with special needs, wheelchair users, and pregnant women, in addition to having a tactile surface and not being too steep to help people with problems with vision. Third, the existence of safe connections is very important in enhancing sidewalk quality to ensure safe continuous walking by commuters, including safe street corners, public transport stops, stairs, crosswalks, and other urban spaces. As stated by Smith [19], “A city’s walking network should integrate safe, accessible connections among different urban spaces like intersections, alleys, stairs and public transport stations. This includes implementing safe street design principles like shorter blocks and crosswalks, raised crossings, and traffic lights timed to pedestrians’ average walking speeds. Sidewalks around transit hubs should also have enough space to avoid creating crowds and allow access for pedestrians with special mobility needs”.

Fourth, clear signage should be designed to enhance communication between the urban space and people, including maps and signs in addition to pedestrian traffic signals at intersections and crossing lights. As a result, signage should be consistent, designed for all knowledge levels of users, easy to find, and consistent. Fifth, attractive spaces provide an environment in which people feel welcomed and comfortable using them, as they include vegetation, greenery, and appropriate urban furniture. As a result, it is important to focus on the types of trees on sidewalks and the urban furniture to make the place livable and enjoyable for users and enhance the social interaction between them; this includes benches and garbage bins. Sixth, security is a vital aspect of sidewalks as it affects the perception of safety among users and, as a result, has an impact on the livability of the space. Safety and security of sidewalks include appropriate public lighting at the pedestrian scale to improve personal safety at night and the existence of active frontages, which keep more eyes on the street all day. Seventh, the quality of the surfaces is an important aspect in defining the quality of sidewalks, including the combination of stable, slip-, and flood-resistant materials based on the needs of the site to enhance the comfort and safety of commuters and users while walking. In addition to this, sidewalk material should be designed to facilitate drainage and be resistant and durable. Eighth, the existence of efficient drainage could enhance sidewalk livability and sustainability, including rain gardens and cross slopes at appropriate angles, to promote sidewalk resilience. Those guidelines and principles are summarized in Table 1.

Table 1. Principles of sustainable and livable sidewalks [19]

Guideline	Element	Result
Universal accessibility	<ul style="list-style-type: none"> • Curb ramps • Tactile surfaces • Low-angle running slope 	Allows everyone access to an urban space
Safe connections	<ul style="list-style-type: none"> • Safe and accessible crosswalks, street corners, stairs, public transport stops, and other urban spaces 	Ensures safe, continuous walking links to other means of transport
Clear signage	<ul style="list-style-type: none"> • Informative maps and signs • Pedestrian traffic signals at intersections 	Promotes communication between people and the urban space
Attractive spaces	<ul style="list-style-type: none"> • Vegetation • Urban furniture 	Provides an environment where people feel comfortable and are encouraged to use the space
Security	<ul style="list-style-type: none"> • Public lighting at the pedestrian scale • Active frontage 	Invites people to occupy urban spaces more regularly and improves security
Quality surfaces	<ul style="list-style-type: none"> • Combination of stable, slip-, and flood-resistant materials based on site needs 	Conveys both comfort and safety while walking
Efficient drainage	<ul style="list-style-type: none"> • Cross slope at an appropriate angle • Rain garden 	Fosters sidewalk resilience
Proper sizing	<ul style="list-style-type: none"> • Sidewalk furnishing zone • Sidewalk pedestrian zone • Sidewalk frontage zone 	Provides enough space for people to use the sidewalk in a variety of ways: to walk, socialize, and access buildings

5. Local case study

The amount of green and open space per inhabitant is 0.33 m² per person in Egypt, which is one of the lowest percentages around the world [20]. As a result, In Cairo, some initiatives started to take place to utilize sidewalks for activities to make neighborhoods more sustainable and liveable. Al-Athar Lina is one of these projects implemented by Megawra (Built Environment Collective), which is based in the Al-Khalifa district, Al-Sayeda Aisha, and would be presented in this part of the research.

5.1 Study context: Al-Khalifa area and background

Al-Khalifa district is located in Fatimid Cairo and contains a variety of crafts and skilled humans, in addition to a large number of historic buildings. The district stretches from around Cairo Citadel Square in the north to the Mausoleum of Imam al-Shafi'i in the south, as shown in Figures 3, 4, and 5. The study focuses on Al-Khalifa-Al-Ashraf Street, and the borders are Al-Saliba Street in the north, Al-Baqli Street in the east, Sayeda Nafisa Square and Cemetery in the south, and Zaynhum Housing and Ibn Tulun Mosque in the east [21]. The region has a total population of 98,497 and an area of 8.308 km² with a population density of 11,856 km². Moreover, there are 22,553 illiterate people, or 23% of the total population, and 2,298 unemployed people, or 4% of the total population in 2012 [22].



Figure 3. A map illustrating the study area location and surroundings



Figure 4. Map illustrating the study area of Qism Al-Khalifa borders [22]



Figure 5. Landmarks in the study area: Sayeda Sukaina, Sayeda Nafisa Mosque, and Al-Ashraf Dome

5.2 Al-Athar Lina's open spaces program, April 2015 to present

Al-Athar Lina (The Monument is Ours) is defined as “a participatory conservation initiative that aims to establish modalities of citizen participation in heritage conservation based on an understanding of the monument as a resource, not a burden” [23]. In addition to this, the Al-Athar Lina project focuses on the cultural heritage's benefits to the community. Moreover, the project depends on the participatory process between all the stakeholders within the conservation program for developing the district, including the abandoned spaces, neglected plots, and sidewalks, in addition to no man's land. The project is run by Megawra, which is a combination between an architecture firm and a non-governmental organization [23].

6. Results and discussion

6.1 Fieldwork results (observations)

The projects aim at enhancing the efficiency of the urban systems of Al-Khalifa to upgrade the built environment to the benefit of creating sustainable neighborhoods for residents, heritage, and the environment [23]. As a result, an abandoned sidewalk in the Al-Khalifa district was utilized as follows and called Al-Hattaba Space. Al-Hattaba public space was established to provide the district with recreational spaces for the children, as work in this area included, as mentioned by Megawra, “garbage and debris removal, grading, construction of stone masonry seating, greening, and laying of artificial turf in addition to four murals inspired by Al-Hattaba's history, and work was completed in 15 days, and the inauguration included a fun day for Al-Hattaba's children with heritage activities, art, storytelling, sports, gardening, graffiti, and origami, followed by a group Ramadan Iftar and a puppet show” [23], as shown in Figures 6 and 7.

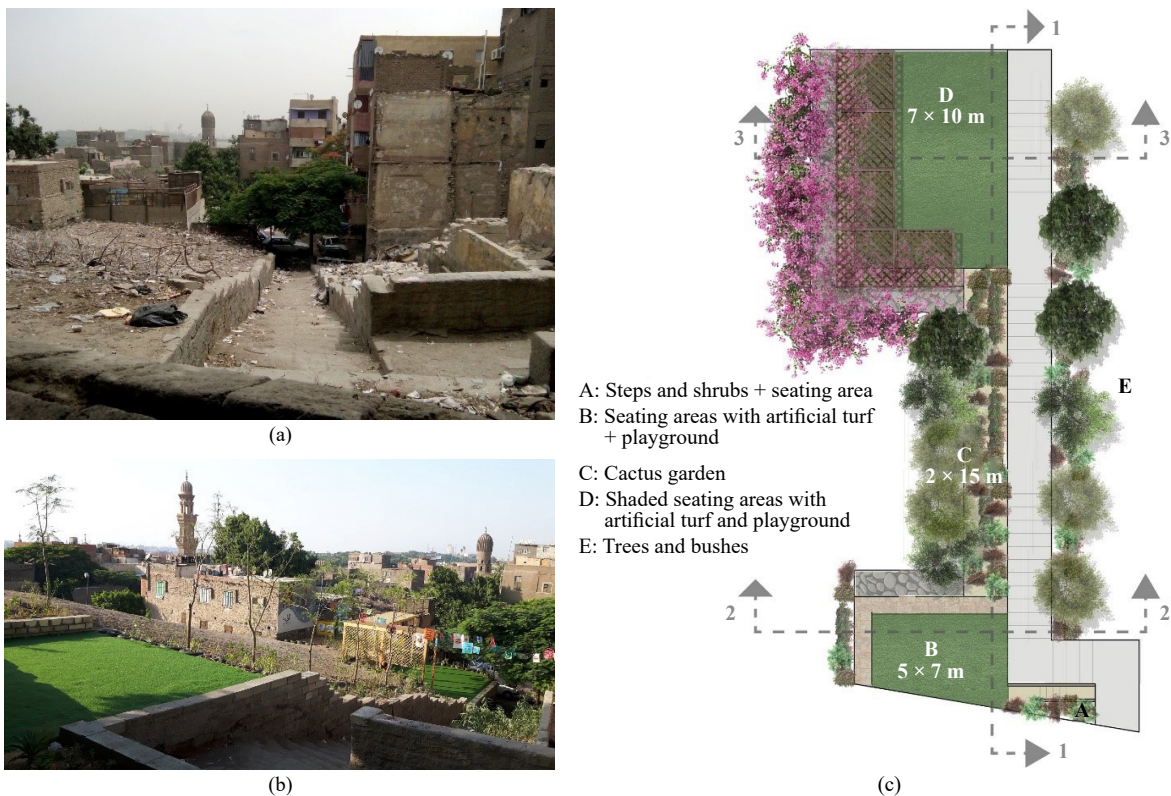


Figure 6. Darb Al-Husr Garden (a) before intervention, (b) after intervention, and (c) the layout [23]



Figure 7. Al-Hattaba playground before and after intervention [23]

6.2 Assessment framework for evaluation

The researcher evaluated the sidewalk in Al-Hattaba via observation, as shown in Table 2, based on the evaluation of each element mentioned in the analytical study. The scale of evaluation ranges between high, low, and neutral quality, based on two main phases: before intervention and after intervention. In addition to this, a survey and questionnaire were done to investigate user preferences.

Table 2. Evaluation of Al-Hattaba sidewalk before and after interventions

Guideline	Element	Evaluation before intervention			Evaluation after intervention		
		High	Neutral	Low	High	Neutral	Low
Proper sizing	• Sidewalk furnishing zone			•	•		
	• Sidewalk pedestrian zone		•			•	
	• Sidewalk frontage zone		•			•	
Universal accessibility	• Curb ramps			•	•		
	• Tactile surfaces			•	•		
	• Low-angle running slope			•	•		
Safe connections	• Safe and accessible crosswalks, street corners, stairs, public transport stops and other urban spaces			•	•		
Clear signage	• Informative maps and signs					•	
	• Pedestrian traffic signals at intersections		•			•	
Attractive spaces	• Vegetation			•	•		
	• Urban furniture			•	•		
Security	• Public lighting at the pedestrian scale		•		•		
	• Active frontage		•			•	
Quality surfaces	• Combination of stable, slip- and flood-resistant materials based on site needs			•		•	
Efficient drainage	• Cross slope at an appropriate angle			•		•	
	• Rain garden			•		•	

There has been a significant change in the quality of the sidewalk that has been developed by adding greenery, lighting, furniture, and clear signage. On the other hand, some elements could be improved to enhance the efficiency of sidewalks in the Al-Khalifa district, such as adding more maps and clear signage, improving frontage and activities, enhancing the slopes of the space, and improving the connection and stairs as well. In addition to this, improving the efficiency of the drainage system would make the sidewalk more sustainable and pleasant for users, so it would be more liveable.

6.3 Survey

The questionnaire was used in this research to assess the individuals' preferences for improving sidewalks in the Al-Khalifa district, Cairo, as it contained two sections: a demographic section and user preference. The questionnaire contained different types of questions: open-ended questions for knowing more details about users; multiple-choice questions to measure differences between different loads of answers (including weights of preference and satisfaction by using rating scale questions such as the Likert scale as it gives a range of options for respondents); and ordinal questions for measuring the acceptance and refusal of users about specific questions by answering yes or no.

6.3.1 First section (demographic information)

The questionnaire was distributed to a sample group of 12 people, as shown in Figure 8. 75% of them are females and 25% of them are males. Concerning the age of the sample group, 78% were aged from 25 to 34 years old, 25% were aged from 35 to 44 years old, and 8% were aged between 18 and 24 years old. In addition to this, the whole sample group had high education degrees. 8% of the sample lives in Al-Khalifa district, while 92% lives in other parts of Cairo, and they only visit Al-Khalifa frequently. 42% of the sample group have already participated in the design and implementation phases of the transformation of the abandoned spaces, while 58% have not. 42% of the sample group visited the studied places.

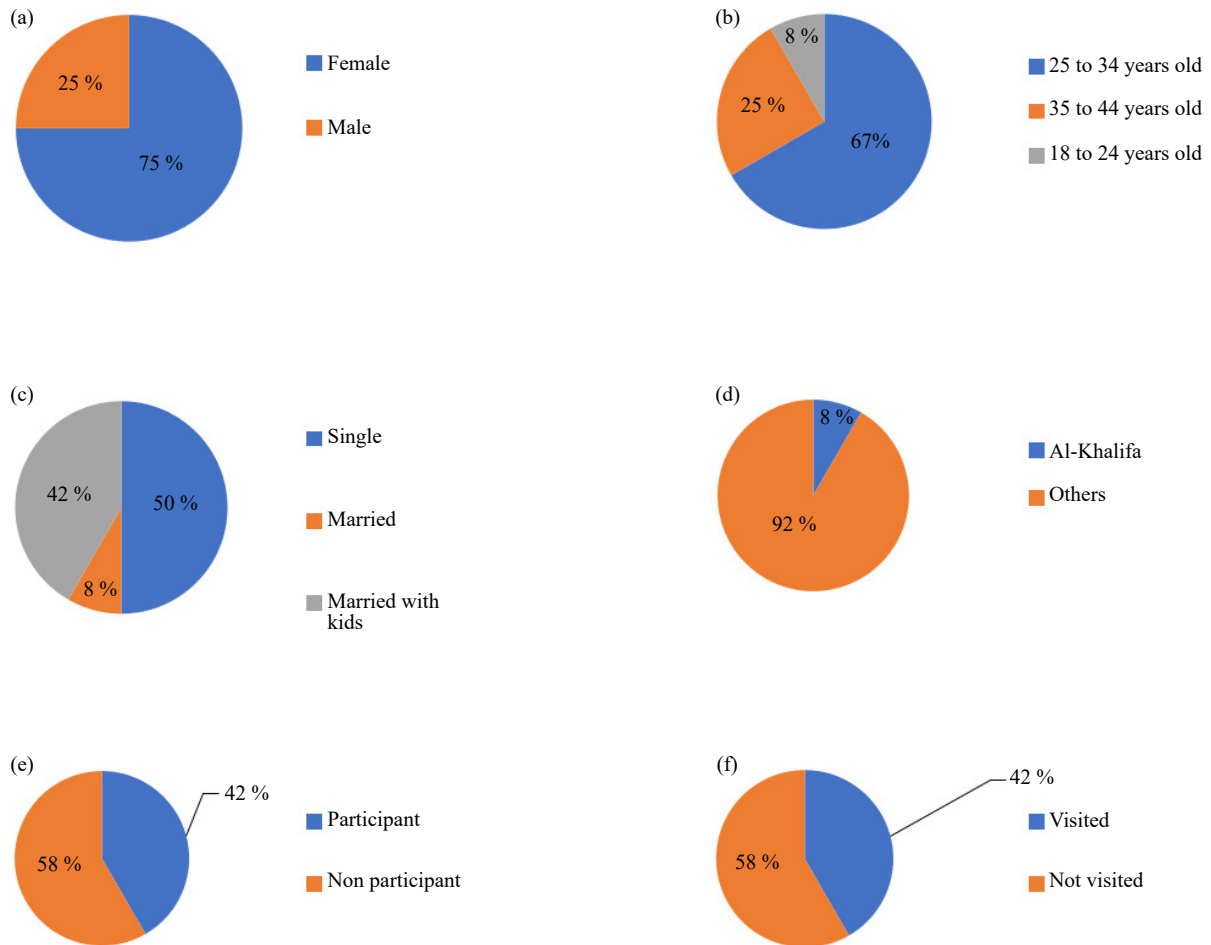


Figure 8. Charts showing demographic information of the sample group, including (a) gender, (b) age group, (c) marital status, (d) living area, (e) user participation, and (f) open space visitation

6.3.2 Second section (user preference)

This section of the questionnaire focused on assessing the user's preference to use this abandoned sidewalk after the urban intervention, using some illustrations and before-and-after photos for each case. This section depends on a Likert scale (from 1 to 5) in answering each question and rating each space, where 5 is the most preferred and 1 is the least preferred, to measure how satisfied the users are with reusing those spaces, as shown in Figure 9. The questionnaire showed that 100% of the sample supported the concept of enhancing neglected sidewalks. However, not all of the sample believed in the benefits of this approach, as only 83% of the sample were very satisfied with it. In addition to this, the sample differed in how accessible those spaces are, as only 33% agreed that they are accessible. Moreover, only 42% felt safe in these places, which is less than half the sample. Concerning the functionality of the spaces, the

result showed that the least functional function was appropriate for the space. At the end of this section, users suggested some interventions, needs, and recommendations for upgrading this site, including increasing green area, developing the existing site, multi-functional space, kids' activities, and a productive urban landscape.

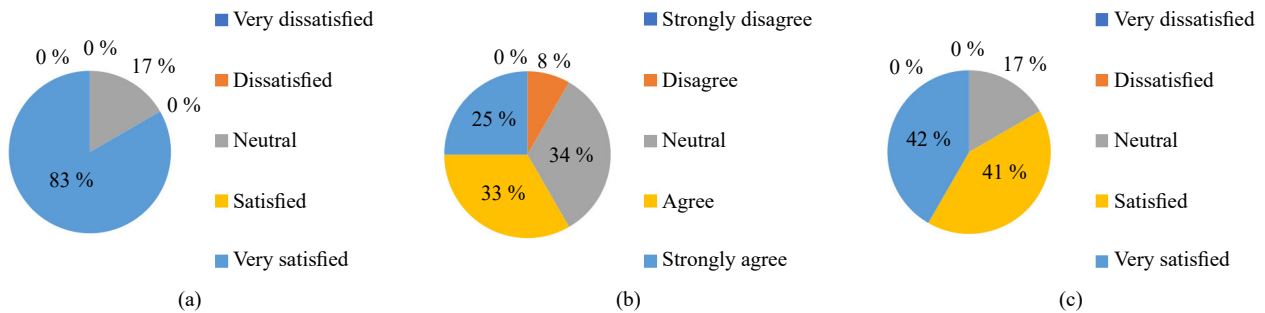


Figure 9. Charts showing the benefits of the place in terms of (a) increasing the quality of life, (b) ease of access to spaces, and (c) a sense of safety

7. Recommendations

Enhancing the streetscape of sidewalks has become an important issue in urban planning and design regarding the decision-making process. Many cities started to focus on people-centered public spaces to achieve sustainable transit modes, including walking and cycling rather than using vehicles, and to promote social interaction. As a result, enhancing social interaction promotes livability and creates different types of social activities, especially on shared streets, that increase the coherence of society. The existence of guidelines is important to facilitate this process and enhance the sidewalk's function as a place for interaction rather than just a path for commuting. Sidewalks should be designed with specific guidelines, including proper sizing, universal accessibility, safe connections, clear signage, attractive spaces, security, quality surfaces, and efficient drainage. As a result, it is recommended to follow these guidelines to achieve sustainability and enhance the quality of life.

8. Conclusion

This study aimed to develop guidelines for designers to enhance the streetscape of sidewalks to promote sustainability and liveability in shared streets, with special reference to Cairo, Egypt. The study focused on streetscape elements that affect the quality of sidewalks, making them more sustainable and liveable. The research formulated some guidelines to enhance the streetscape of sidewalks, including proper sizing, universal accessibility, safe connections, clear signage, attractive spaces, security, quality surfaces, and efficient drainage. As presented in the analytical study, the research resulted in the formulation of these guidelines with their indicators to measure the efficiency of the streetscape and sidewalks. As a result, it emphasized the importance of guidelines for designers in achieving sustainability. Moreover, it is highly recommended to accomplish some of the suggested interventions to enhance the sustainability and liveability of the streetscape and sidewalks in the chosen case study. The final observations shed some light on the importance of more investigation into sidewalks in different situations in other locations in Cairo.

Conflict of interest

There is no conflict of interest in this study.

References

- [1] Department of Economic and Social Affairs, Population Division. *World urbanization prospects: The 2014 revision*. United Nations. Report number: ST/ESA/SER.A/366, 2015. <https://population.un.org/wup/publications/files/wup2014-report.pdf>
- [2] Salama AM. Coronavirus questions that will not go away: interrogating urban and socio-spatial implications of COVID-19 measures. *Emerald Open Research*. 2020; 2: 14. <https://doi.org/10.35241%2Femeraldopenres.13561.1>
- [3] Jainar S, Shivani. COVID-19 and green, open spaces: What is going to be our new normal? *DownToEarth*. Jun 2 2020. <https://www.downtoearth.org.in/blog/urbanisation/covid-19-and-green-open-spaces-what-is-going-to-be-our-new-normal--71501> [Accessed 10th December 2023].
- [4] The Global Goals. *11 SUSTAINABLE CITIES AND COMMUNITIES Make cities and human settlements inclusive, safe, resilient and sustainable*. <https://www.globalgoals.org/goals/11-sustainable-cities-and-communities/> [Accessed 1st January 2023].
- [5] Giljum S, Hinterberger F, Bruckner M, Burger E, Frühmann J, Lutter S, et al. *Overconsumption? Our use of the world's natural resources*. Austria: Friends of the Earth Austria; 2012. <https://friendsoftheearth.eu/publication/overconsumption-our-use-of-the-worlds-natural-resources/>
- [6] Chen S, Chen B. Sustainable urban metabolism. In: Jorgensen SE. (ed.) *Encyclopedia of environmental management*. Boca Raton: CRC Press; 2012. p.1-8.
- [7] UN Conference on Sustainable Development. *Report of the United Nations Conference on Sustainable Development: Rio de Janeiro, Brazil, 20-22 June 2012*. United Nations. 2012. <https://digitallibrary.un.org/record/737074?ln=en>
- [8] Kafrawy M, Attia S, Khalil HA. The impact of transit-oriented development on fast-urbanizing cities: Applied analytical study on Greater Cairo Region. *Journal of Contemporary Urban Affairs*. 2022; 6(1): 83-95. <https://doi.org/10.25034/ijcua.2022.v6n1-8>
- [9] Wiktionary. *streetscape*. <https://en.wiktionary.org/wiki/streetscape> [Accessed 14th March 2023].
- [10] Moroney A. Healthy spaces and places: A national guide to designing places for active living. *Australian Planner*. 2009; 46(2): 11-15. <https://doi.org/10.1080/07293682.2009.9995303>
- [11] Diaz-Sarachaga JM, Jato-Espino D, Castro-Fresno D. Evaluation of LEED for neighbourhood development and envision rating frameworks for their implementation in poorer countries. *Sustainability*. 2018; 10(2): 492. <https://doi.org/10.3390/su10020492>
- [12] Wolf KL. Roadside urban trees- Balancing safety and community values. *Arborist News*. 2006; 15(6): 56-57. https://www.naturewithin.info/Roadside/ArbNews_TreeSafety.pdf
- [13] Talen E, Koschinsky J. The walkable neighborhood: A literature review. *International Journal of Sustainable Land Use and Urban Planning*. 2013; 1(1): 42-63. https://www.researchgate.net/profile/Julia-Koschinsky/publication/287170881_The_Walkable_Neighborhood_A_Literature_Review/links/58d4224045851533784fd4a9/The-Walkable-Neighborhood-A-Literature-Review.pdf
- [14] ElMoghazi Y. *Road safety challenges in Egypt: A discussion of policy alternatives*. Master's thesis. The American University in Cairo; 2019. <https://fount.aucegypt.edu/etds/790/>
- [15] Forsyth A. What is a walkable place? The walkability debate in urban design. *Urban Design International*. 2015; 20: 274-292. <https://doi.org/10.1057/udi.2015.22>
- [16] Linning SJ, Eck JE. *Whose 'eyes on the street' control crime? Expanding place management into neighborhoods*. England: Cambridge University Press; 2021. <https://doi.org/10.1017/9781108954143>
- [17] Koo BW, Guhathakurta S, Botchwey N. How are neighborhood and street-level walkability factors associated with walking behaviors? A big data approach using street view images. *Environment and Behavior*. 2022; 54(1): 211-241. <https://doi.org/10.1177/00139165211014609>
- [18] Mozingo L. Women and downtown open spaces. *Places*. 1989; 6(1): 38-47. <https://escholarship.org/content/qt7jd71866/qt7jd71866.pdf>
- [19] Smith H. *8 Principles to Better Sidewalks*. <https://thecityfix.com/blog/8-principles-better-sidewalks-hillary-smith-paula-manoela-dos-santos/> [Accessed 14th March 2023].
- [20] Attia S, Mahmoud A. Green roofs in Cairo: A holistic approach for healthy productive cities. In: *Proceedings of 7th Annual Greening Rooftops for Sustainable Communities*. Atlanta, United States: Greenroofs for Healthy Cities; 2009. <https://hdl.handle.net/2268/167604>
- [21] Built Environment Collective. *Athar Lina Ground Water Research Project*. <https://megawra.com/researches/athar-lina-groundwater-research-project/> [Accessed 14th March 2023].
- [22] The United Nations Educational, Scientific and Cultural Organization (UNESCO). *Urban Regeneration for*

Historic Cairo. <https://whc.unesco.org/en/historic-cairo-project/> [Accessed 10th December 2023].

- [23] Megawra (Built Environment Collective). *The provision of recreational spaces for children in underprivileged areas*. 2018. https://www.facebook.com/Megawra/posts/pfbid0AsTENrFezaKCeMkewMnEdFDRih3Y6asCvDc_gX3SdyxgCiGqBxcJQcdoP5Z6g9Cjl [Accessed 1st January 2023].

Appendix

Survey on assessing individuals' preferences for utilizing abandoned sidewalks in Al-Khalifa district, Cairo (sample group of 12 users of the studied spaces).

The introduction:

Dear resident, thank you for taking the time to complete this survey. Your responses will contribute to research that is being conducted by a researcher from Cairo University. It focuses on assessing the individuals' preferences for utilizing abandoned spaces in Al-Khalifa district, Cairo. To reach this aim, the researcher uses questionnaires (quantitative methods) for the inhabitants and the experts in this field.

The survey will take a maximum of five minutes to complete, and it is composed of two main sections that will establish some basic demographic information and user preferences.

The online consent form:

Please check the boxes below to indicate that you consent to take part in this survey.

1. I understand that my participation is voluntary, and I am free to stop my participation at any time by closing the survey. However, once I submit the survey, the researcher cannot remove my answers because they are anonymized.
2. Your name (or other identifying information) will not be collected through this survey, so by clicking the box, you are just consenting for the data you submit to be used in the study.
3. Based on the above, I agree to take part in this study.

Section A: Demographic information

- a. What is your age?
 - Under 18
 - 18 to 24 years old
 - 25 to 34 years old
 - 35 to 44 years old
 - 45 to 54 years old
 - Over 55
- b. What gender do you identify as?
 - Male
 - Female
 - Prefer not to say
- c. What is the highest degree or level of education you have completed?
 - Less than a high school diploma
 - High school degree or equivalent
 - Bachelor's degree (e.g., Bachelor of Arts, Bachelor of Science)
 - Master's degree (e.g., Master of Arts or Master of Science)
 - Doctorate
 - Other (please specify)
- d. Do you have any architecture or planning background? If yes, choose from the following list; if no, please leave this question.
 - Planner
 - Architect
 - Civil engineer
 - Teaching civil engineering
 - Teaching (architecture or planning)
 - Other
- e. Please state in which district of Cairo you live.
 - Al-Khalifa

- Other
- f. How many children do you have?
 - I don't have children
 - One child only
 - Two children
 - Three children or more
- g. Have you participated in any of Al-Khalifa's abandoned area transformation projects?
 - Yes
 - No

Section B: User preference in reutilizing the abandoned spaces in Al-Khalifa District

This question focuses on assessing the user's preference to use the abandoned spaces after the urban intervention.

Reusing sidewalks in the Al-Khalifa neighborhood

Please rate each space in the following table from 1 to 5, where 5 is the most preferred and 1 is the least preferred.

From your point of view, how satisfied are you with reusing those spaces?

- a. Have you visited any of them?
 - Yes
 - No
- b. Do you promote the concept of reusing sidewalks as public spaces?
 - Yes
 - No

1 for the least benefit and 5 for the maximum benefit

- | | | | | | |
|--|---|---|---|---|---|
| c. To what extent do you see the benefit of reusing marginalized spaces to increase the quality of life in neighborhoods | 1 | 2 | 3 | 4 | 5 |
| d. Your evaluation of the reuse of the space in Al-Hattaba Park in terms of the function. | 1 | 2 | 3 | 4 | 5 |
| e. How do you rate the ease of access to spaces? | 1 | 2 | 3 | 4 | 5 |
| f. How do you rate the feeling of safety after reutilizing those spaces? | 1 | 2 | 3 | 4 | 5 |
- g. What are your suggestions for other functions to use the other neglected spaces (restaurants, green areas, etc.)?
