



## *Improving a pedestrian friendly environment in low income Egyptian districts*

**Samaa Ali <sup>a</sup>, Aya Said <sup>b</sup>, Marwa Adel El-Sayed <sup>a, b, \*</sup>**

<sup>a</sup> Student at the British University in Egypt (BUE), Address, Faculty of Engineering, Architectural Engineering Department, El Sherouk City, Egypt

<sup>b</sup> Teaching assistant at the British University in Egypt (BUE), Address, Faculty of Engineering, Architectural Engineering Department, El Sherouk City, Egypt

<sup>a, b</sup> Associate Professor at the British University in Egypt (BUE), Address, Faculty of Engineering, Architectural Engineering Department, El Sherouk City, Egypt

E-mail: <sup>a</sup>Samaa181939@Bue.edu.eg, <sup>b</sup>Aya,Said @Bue.edu.eg <sup>a</sup>

<sup>b</sup>Marwa.Adel@Bue.edu.eg

### **Abstract**

*In many developing countries, districts were mainly designed for cars rather than pedestrians' despite of the need for encouraging walkability. Furthermore, streets are becoming more crowded and congested with poor or even non-existent pedestrian facilities. In addition to, low income residents claimed that they suffered from walking daily a distance 1-2 km without any facilities to be found in the street within the district. Therefore, the aim of this research is to develop a checklist for the factors that would aid in the decision –making process for the improvement of pedestrian facilities in the Egyptian districts. Delphi technique is used to correlate the urban design sustainability with both principles of walkability & pedestrian facilities. the Result shows that the most important facility that should be applied at first Infrastructure then followed by Side Walk, complete streets, Livability, Safety then Mobility. This list would be as a guide for the futuristic urban planners and authorities in order to develop the pedestrian facilities in Egypt and also in an other developing countries*

**Keywords: Egyptian districts, pedestrian facilities, walkability, low income residents, pedestrian friendly**

**ENGINEERING JOURNAL** Volume # Issue #

Received Date Month Year

Accepted Date Month Year

Published Date Month Year

Online at <https://engj.org/>

DOI:10.4186/ej.20xx.xx.x.xx

## Introduction

According to INCTEST (2020), pedestrian was known as the movement of people from place to another using their own foot. The city faces difficulties due to congested roadways with traffic and other mobility problems. Regarding policy significance, the Egyptian constitution, legislation, and regulations must reflect the people's rights to well-established pedestrian-friendly streets (El Ghandour, 2017). The proposed study, however, is more concerned with pedestrian-friendly roadways than pedestrian-only ones. Numerous theories and notions were researched and considered.

It directs and prioritizes transportation authorities to improve the safety and mobility of pedestrians in general, and the elderly in particular, in their plans, policies, and programs (Magdy, 2022). In low-income cities walking is the most popular mode of transportation. The microbus is the second-most popular mode of transportation. Residents have complained that the minibuses are crowded, dirty, and occasionally unsafe; as a result, this could be an area for reform where involvement would help manage the transportation system. Some planners focused on cycling as gap filler in the twenty-first century to lessen traffic congestion (Maged, Moussa, & Konbr, 2022). The main benefits are reducing both traffic congestion and vehicle parking, which may also lower the cost of street upkeep and traffic conveniences (Ghonimi, & Awaad, 2018). If more people chose to walk instead of drive or use alternative forms of transportation, the community's automobile footprint would be lowered and carbon emissions may be decreased.

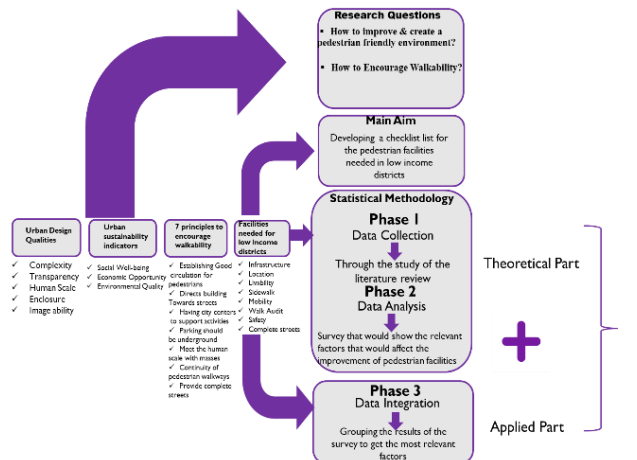


Figure 1 Research Structure

## Literature review

### Walkability

This essay's goal is to compile a thorough list of variables that can be taken into consideration when making decisions on how to improve pedestrian amenities in urban settings ( Zuniga-Teran, Orr, Gimblett, Chalfoun, Marsh, Guertin, & Going, 2017). Through a literature review and expert participation, a preliminary list of 57 criteria that affect the improvement of pedestrian facilities in the metropolitan area was found. The compilation was done based on how frequently earlier studies had cited each other (Aromal, & Naseer, 2022). The variables were then divided into five key areas, including (1) Facilities; (2) Location; (3) Ambience/Liveability; (4) Security and Safety; and (5) Movement, which define pedestrian facilities Figures, tables and bullets



*Figure 2 The Walkability Framework*

source::<https://ars.els-cdn.com/content/image/1-s2.0-S2095263516300656-gr1.jpg>

#### 2.1.1 Policies focused on pedestrians

The design approach also took into account pedestrian experiences and the advantages of walking for psychological well-being. However, the situation in underdeveloped nations is different ( Polonyi, 2022). Low-income commuters and people with limited mobility who make journeys primarily for work-related or subsistence-related needs are more likely to use the walking mode ( Adriaola-Steil, & Schwedhelm, 2020). Studies have shown that in many Indian cities, the average daily trip distance is less than 5 km, with walking being the preferred form of transportation for excursions under 2 km. According to statistics, 22.6% of Indians choose to walk to work as a form of transportation. People who live in cities tend to walk more frequently. (Aromal, & Naseer, 2022).



*Figure 3 Policies focused on pedestrians*

source:[https://media.lasvegassun.com/media/img/photos/2015/02/27/Screen\\_Shot\\_2015-02-27\\_at\\_12.23.27\\_PM\\_t600.png?42b0fb247f69dabe2ae440581a34634cbc5420f3](https://media.lasvegassun.com/media/img/photos/2015/02/27/Screen_Shot_2015-02-27_at_12.23.27_PM_t600.png?42b0fb247f69dabe2ae440581a34634cbc5420f3)

## 2.2 Urban Design Qualities

The study successfully developed metrics for five aspects of urban design, including image ability, enclosure, human size, transparency, and complexity. Nevertheless, they were unable to operationalize four other aspects from their initial list, including linkage, readability, cohesiveness, and tidiness (Nunes, & Vale, 2015).

### 2.2.1 Complexity

Urban design complexity can be emancipatory, refocusing top-down strategies as freeing bottom-up partnerships that reorganise the built environment to enhance fairness, spatial justice, adaptability, and social interaction and exchange (Elsheshtawy, 1997).



*Figure 4 high complexity city*

source:

[https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSBBPMGTm6lqYReC\\_u8bKihHkOgr06ImDySog&usqp=CAU](https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSBBPMGTm6lqYReC_u8bKihHkOgr06ImDySog&usqp=CAU)



*Figure 5 low complexity city*

source:

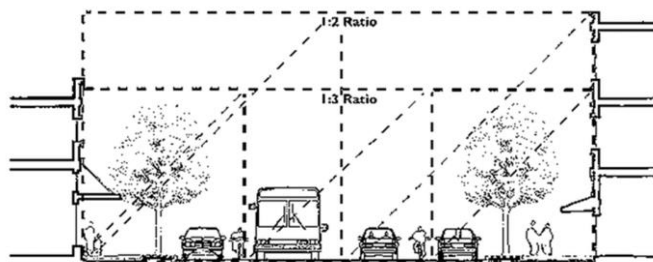
Figure (5)

<https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSwGaMh2Ojz2YtM9uwkbsqkjo6v5IZSIXwnRw&usqp=CAU>

However, figure (4) represents high complexity with a wide range of building and accent colours, dining establishments, and pedestrian traffic, this street has a rich visual aesthetic. Though, figure (5) represents less complexity with this city scene is extremely simple, with few colours, few buildings, and more walkability areas for pedestrians.

## 2.2.2 Human Scale

Researches have revealed that uninteresting mega structures make individuals feel stressed out (we refer to these structures as having "architecture of place"). Environmental psychology is a whole academic field that focuses on studying how people interact with their physical surroundings (Jia, Kaw, Gapihan, Kim, Lozano, & Nitti, 2016).



*Figure 6 Human scale (human + planting + building + road)*

source:<https://www.researchgate.net/publication/311403757/figure/fig2/AS:435660512337922@1480880968070/Human-scale-human-planting-building-road-http-wwwiteorg-css-online-DWUT04html.png>

## 2.2.3 Image ability

When specific physical features and how they are arranged draw the eye, elicit strong emotions, and leave a long-lasting imprint, the location has high image ability ( Filomena, Verstege, & Manley, 2019). Moreover, distinct perspectives can make an otherwise unimpressive place imaginable (Ewing, & Handy, 2009).



Figure 7 urban cities image ability

source: [https://www.google.com/url?sa=i&url=https%3A%2F%2Farchive.uneews.utah.edu%2Fnews\\_releases%2Furban-design-matters-when-it-comes-to-street-life%2F&psig=AOvVaw0quOvFaT4TFbZXQUstQ6z1&ust=1668986706679000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCNjXyOGzu\\_sCFQAAAAAdAAAAABAI](https://www.google.com/url?sa=i&url=https%3A%2F%2Farchive.uneews.utah.edu%2Fnews_releases%2Furban-design-matters-when-it-comes-to-street-life%2F&psig=AOvVaw0quOvFaT4TFbZXQUstQ6z1&ust=1668986706679000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCNjXyOGzu_sCFQAAAAAdAAAAABAI)

## 2.2.4 Enclosure

When discussing enclosure, it's important to understand how many vertical elements like walls, trees, and other vertical structures visually define streets and other public places. Room-like qualities can be found in areas where vertical elements' heights are proportionally connected to the width of the space between them ( Moskerintz, 2018).



Figure 8 “buildings, Walls and high Urban Enclosure figure (8) source:

[https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.chrishaille.com%2Ffamily-of-urban-design-the-sense-of-enclosure-theory%2F&psig=AOvVaw2BfKpOiSaL5CceIR-xlKTY&ust=1668985098569000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCP Cap Petu\\_sCFQAAAAAdAAAAABAD](https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.chrishaille.com%2Ffamily-of-urban-design-the-sense-of-enclosure-theory%2F&psig=AOvVaw2BfKpOiSaL5CceIR-xlKTY&ust=1668985098569000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCP Cap Petu_sCFQAAAAAdAAAAABAD)

## 2.2.5 Transparency

By ensuring that urban policies are implemented with the interests of all . demographic groups in mind, transparent urban planning can improve accountability (Fu Glory, 2006).



Figure 9 highly Transparency spaces

source: figure (9)

[https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.hurriyetdailynews.com%2Fhousing-agencys-reign-grows-amid-esthetic-and-transparency-criticism-54846&psig=AOvVaw0ILSRJ5XLCpfvUa8ikfa0&ust=1668982286857000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCIiJK-ju\\_sCFQAAAAAdAAAAABAD](https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.hurriyetdailynews.com%2Fhousing-agencys-reign-grows-amid-esthetic-and-transparency-criticism-54846&psig=AOvVaw0ILSRJ5XLCpfvUa8ikfa0&ust=1668982286857000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCIiJK-ju_sCFQAAAAAdAAAAABAD)

Highly Transparent' cities are greatly preferred that is because people are capable of seeing what lies at the edges of the streets and buildings are clearly observed.

## 2.3 Key Principles to Improve Walkability

The developed environment's ability to accommodate people walking, living, shopping, visiting, enjoying, or simply spending time in a place is known as walkability ( El Messeidy, 2019).

### 2.3.1 Establishing Good Circulation for Pedestrian

Urban regions should refrain from erecting thick, impermeable walls and instead segment the roadways. Restaurants along the sidewalk support the walker's inquiry ( El Messeidy, 2019)



Figure (10) accessible circulation for pedestrian

### 2.3.2 Direct Buildings Towards Streets and Open Spaces

In order to minimise disruption to walkers, loading platforms, tunnels, and garages should be modest and limited (El Messeidy, 2019). Building entrances are located next to or on sidewalks ( El Messeidy, 2019)



Figure (11) spacious public areas for pedestrians

### 2.3.3 Having City Centres to Support Community Activities

Outdoor areas can become more important by adding a climbing wall outside or a community gym. Outreach playground allows parents and children to interact in highly congested areas ( El Messeidy, 2019)



Figure (12) open areas for people to hang out with their families

### 2.3.4 Parking Lots Should Be Underground or Behind Structures

Parking is pricy, unsightly, necessary for vehicles, and it serves as a revenue resource. They should be offered in multi-layered buildings that are positioned in a continuous pedestrian area ( El Messeidy, 2019).



Figure (13) underground parking lots

### 2.3.5 Meet The Human Scale with Masses and Urban Elements

At the scale of their own body space, pedestrians can sense the urban environment. This facade has been sized to accommodate walkers ( El Messeidy, 2019)



*Figure (14) a good human scale in urban areas*

### 2.3.6 Cleanness and continuity of pedestrian walkways

The city's infrastructure, which includes trees, lights, and road furnishings, is made up of broad walkways. Grand Place in Brussels continues to be popular with tourists and residents who stop by as onlookers and agree with the numerous bars and shops there ( El Messeidy, 2019).



*Figure (15) cleanness of pedestrians' walkways*

### 2.3.7 Provide Complete Streets

A comprehensive roadway is one that offers safe, pleasant, advantageous access and movement for pedestrians, bikers, drivers, and just about everything becoming equal such as capabilities, and preferences ( El Messeidy, 2019).



Figure (16) complete street strategic initiative

## 2.4 Urban Sustainability

There are many different urban sustainability indicators that have been designed for a particular objective, issue, or geographical area. Despite the fact that there are many of them and that they vary from one another in specifics, they are typically organised around three key themes: social, economic, and environmental ( Paykoç, 2018)

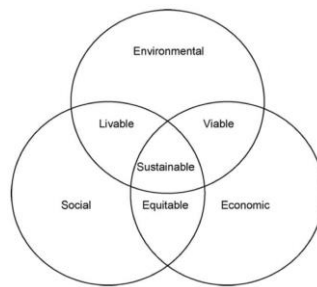


Figure (17) Classic Dimensions of Sustainable Development

source:

[https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.researchgate.net%2Ffigure%2FClassic-Dimensions-of-Sustainable-Development-Tanguay-et-al-2010-pp-408\\_fig1\\_354204199&psig=AOvVaw2UwrBzKEu0cpd93DzximCR&ust=166949486491000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCOiq-tiYyvsCFOAAAAAdAAAAABAD](https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.researchgate.net%2Ffigure%2FClassic-Dimensions-of-Sustainable-Development-Tanguay-et-al-2010-pp-408_fig1_354204199&psig=AOvVaw2UwrBzKEu0cpd93DzximCR&ust=166949486491000&source=images&cd=vfe&ved=0CBAQjRxqFwoTCOiq-tiYyvsCFOAAAAAdAAAAABAD)

Dimensions of Sustainable Urban Development	Elements Necessary for Sustainable Urban Development
Social Wellbeing	Healthiness
	Safety
	Accessibility to affordable houses & facilities
	Accessibility to public reformation & open areas
	Accessibility to a different transportation alternatives
Economic Opportunity	A varied & competitive local & regional economy
	Transportation & other substructure corresponding with land usage
	Growing plants that influence existing possessions
	Accessibility to capital & credit
	Accessibility to education, employments & training
Environmental Quality	Effectual land usage
	Usage of renewable resources
	Waste/pollution reduction & management
	Climate change & natural disaster modification, adaptation & flexibility
	Carbon effectual & environmentally comprehensive transportation

To sum up, walkability can be characterised as the standard for sustainability through promoting social well-being, economic security, and protection of the environment (Paykoç, 2018). This definition demonstrates that walking is a physical, physiological, and social economic act; even though it is still viewed and perceived only as a body movement that takes us from one place to another.

## 2.5 Facilities needed to make the district walkable for low income residents

### 2.5.1 Physical infrastructure

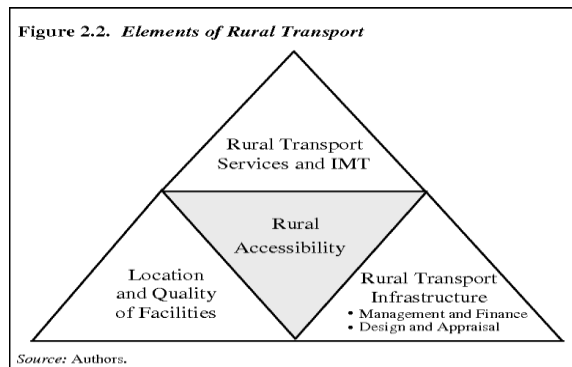


Figure (18) elements of rural transport

### 2.5.2 Accessibility Infrastructure

Construction side ramps were deserted, and the mysterious elevators were filthy. Today, however, those who need wheelchairs are vastly outnumbered and frequently share, if not compete for, parking places, ramps, and elevators. Unnoticed is a striking increase in the variety of users of accessible venues, including those with various needs (Donovan, 2018)



Figure (19) accessible infrastructures for all inhabitant

### 2.5.3 Functional Infrastructure

These qualities include being environmentally friendly, having access to public transportation, and having facilities. Practical walkability metrics are measures of a neighbourhood’s convenience and ease of walking using scientifically measurable characteristics, whether commuting for work or non-work activities ( Baobeid, Koç, & Al-Ghamdi, 2021)

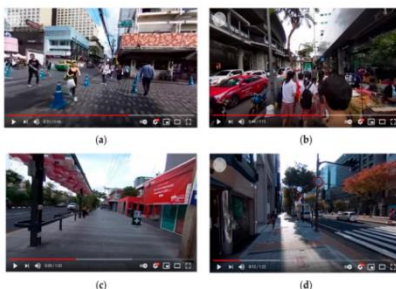


Figure (20) the essential

functional amenities for

pedestrians

### 2.5.4 Location

A street that is truly walk able has a positive link between the public world outside and the private or semi-public life inside buildings. However, "lifeless" uses like banks, workplaces, car parks, and warehouses with bare walls shouldn't be situated along the public roadway. However, uses like eateries or newsstands can improve walkability (Singh, 2016).



Figure (21) Location-Based Factors

### 2.5.5 Liveability

Parallel to these worldwide trends, enhancing population health and reducing disparities are only two areas where developing "liveable" cities has become a top concern. ever since the start of the urban planning and public health disciplines have been urged to collaborate as a result of the growing understanding of the importance that urban settings significantly influence health and quality of life and the Urban Renewal movement ( Alderton, Davern, Nitvimol, Butterworth, Higgs, Ryan, & Badland, 2019)



Figure (22) 2FSustainability Liveability and Walkability

### 2.5.6 Safety & Security

People's perceptions of safety in the built environment and the built environment's design are strongly correlated. Certain factors were singled out as being crucial in affecting how individuals perceive their level of safety,



*Figure (23) crossroads provided with surveillance for the safety and security of pedestrians*

## 2.5.7 Mobility

The context for investigating neighbourhood environment elements that affect older individuals' mobility and health is set by these parallel activities. Environments where people live, work, and play so provide the background for the development and development of health behaviours and outcomes (Hirsch, Winters, Clarke, Ste-Marie, & McKaybgh, 2017).



*Figure (24) urban cities mobility*

## 2.5.8 Sidewalk

The sidewalk must adhere to requirements in four key areas, including accessibility, supporting infrastructure, security, and convenience. In terms of the scale of metropolitan regions, the number of individuals who commute each day, and the variety of options for personal transport, urban environments are always growing and changing (Gao, Qian, Chen, Zhong, Zhou, & Aminpour, 2022)



*Figure (25) sidewalk walkability*

## 2.5.9 Walk-audit

Walk audits could indeed be most successful when state officials and social members of various backgrounds, age group, and qualities are purposefully encouraged and welcomed along in order to perceive and interact to the conditions firsthand, in addition to documenting various problems and involving the society in promoting for advancements(Mackey, n,d)



*Figure ( 26) walk audit*

### **2.5.10 Complete streets**

A full street's design takes into account the public right-of-way as well as the land uses and architectural style of neighbouring properties, including the selection of suitable building heights and the planning of neighbouring land uses that actively participate in the public street environment ( Robbins, 2017).



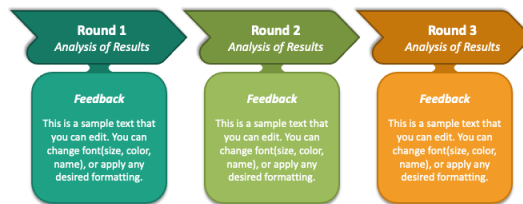
*Figure (27) complete streets*

### **Research Method**

Based on the literature review, the research method will be done through Delphi survey which is about group of experts are subjected to a series of in-depth surveys with controlled opinion feedback in order to get a consensus. Moreover. it is a methodical methodology that permits the input of experts from many locations and fields of expertise. Additionally, the interaction between the panellists, who have a range of abilities, knowledge, and expertise on the subject from different angles, could lead to a better answer. Planning for pedestrian facilities and improving them typically involve multiple dimensions (Haughey,2021).

## DELPHI METHOD

Delphi Forecasting Method



*Figure (28) Delphi method*

After identifying a diverse group of 15-35 experts a set of questionnaire have been made for them related to the principles of walkability, urban design qualities, urban sustainability indicators and how they will be linked to facilities needed in order to make the Egyptian district walkable for low income people. Moreover, for round one the expertise will be ordered to answer those questions and also to clarify the reasons of this answers. Furthermore. The results of round one is going to be summarized and a set of new questions based on the first round are going to be sent for them to get more reliable answers. finally, the same would be done for the third round to get a ranking for the most important facilities should be applied in the low income Egyptian districts.

## Results & Discussion

Urban qualities have an effective role in improving pedestrian friendly environment especially in low income districts. For less complexity helps on increasing walkability areas with simple, colourful scenes and few buildings. Moreover, high transparency is greatly preferred as it helps pedestrians to see the street edges and buildings ahead of them. Besides, increasing human scale with the presence of stores and active life provides pedestrians with enjoyable environments. Furthermore, low enclosure is considered one of the main factors of improving a pedestrian friendly environment that is because streets are well designed so people have plenty of open spaces which encourages and improves walkability. Finally, imaginable places are more attractive for pedestrian as it encourages them to walk in lively streets instead of dull lifeless streets. In addition to, Delphi survey made us reach a checklist table linking all the urban design qualities, urban indicators, principles of walkability and also the facilities. The results show that Infrastructure with its three types (physical, functional & accessibility) represents 44% from the whole facilities which means that it is essential in improving the walkability in Egyptian context. Moreover, having a complete street that have lanes for cycling, walking & the movement of cars and sidewalk were play a

vital role in having traffic regulations in low income Egyptian districts in order to create a pedestrian environment.

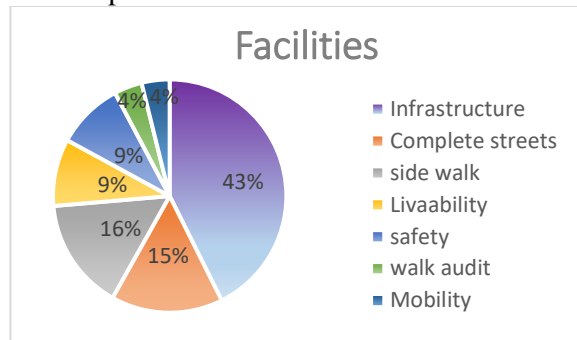


Figure (29) shows chart of the facilities

Urban sustainability	Principles of walkability	Facilities										Urban Qualities
		Sidewalk	Location	Livability	Walk audit	Safety & Security	Complete Streets	Physical Infrastructure	Mobility	Functional Infrastructure	Accessibility Infrastructure	
Social-wellbeing	City center with activities		✓	✓				✓		✓	✓	Complexity - Enclosure
	Direct buildings towards streets & open spaces			✓		✓				✓		Transparency
	Provide complete streets	✓			✓		✓	✓	✓	✓	✓	Image-ability
	Continuity of pedestrian walkways	✓			✓				✓		✓	Complexity - Enclosure
Economic Opportunity	City center with activities		✓	✓				✓		✓	✓	Complexity - Enclosure
	Provide complete streets	✓			✓		✓	✓	✓	✓	✓	Image-ability
	Establishing good circulation	✓				✓	✓				✓	Transparency
Environmental Quality	Parking should be underground		✓									
	Meet human Scale with masses			✓			✓			✓		Human Scale-Image-ability
	Establishing good circulation	✓				✓	✓				✓	Transparency

Figure (30) Checklist table

## **Conclusion**

This research shows the challenge in making the district with its services walkable and not only the neighbourhood. As we know the low income residents have claimed that because of the money sometimes they suffer paying for transportation so walking would be their only mode of transportation despite the non – welcoming pedestrian facilities existed in Egypt. In this paper, the right order for the facilities from the most important ones till the least have been made in a checklist to be applied in the low income districts in order to create a pedestrian friendly environment for them.

## **Acknowledgement**

The completion of The research could not have been possible without the participation of My professor and supervisor Dr. Marwa Adel and I would like to express my deep appreciation for her invaluable patience, huge support, Suggestions & feedback throughout the whole year. I am also extremely grateful to my TA. Aya Said for her continuous support & feedbacks throughout the year.

## References

1. Aromal, V. & Naseer, M. (2022) A methodology for the identification of significant factors for the improvement of pedestrian facilities in an urban area. Retrieved from <https://doi.org/10.1016/j.jum.2022.04.007>
2. Adriazola-Steil, C. & Schwedhelm, A.(2020) Walking the Talk: What Can We Learn from Germany’s New Pedestrian Policy Framework? Retrieved from <https://thecityfix.com/blog/walking-talk-can-learn-germanys-new-pedestrian-policy-framework-2-claudia-adriazola-steil-alejandro-schwedhelm/>
3. Alamoush, S. & Kertész, A.(2022) Imageability of cities in regards of attractiveness: A case of Salt City in Jordan. Retrieved from <https://akjournals.com/view/journals/606/17/1/article-p168.xml>
4. Alderton, A., Davern, M., Nitvimol,K., Butterworth, I., Higgs, C., Ryan, E. & Badland, H.(2019) What is the meaning of urban liveability for a city in a low-to-middle-income country? Retrieved from <https://d-nb.info/1202078095/34>
5. Banker, C. (2018) A City Built for People, Not Cars. Retrieved from <https://www.homageproject.org/usa/a-city-built-for-people>
6. Barter, P. (2018) Walkable Parking: How to Create Park-Once-and-Walk Districts. Retrieved from <https://www.reinventingparking.org/2018/01/walkable-parking-how-to-create-park.html>
7. Bereitschaft, B. (2021) Walkable Cities: Revitalization, Vibrancy, and Sustainable Consumption. Retrieved from <https://muse.jhu.edu/article/839956>

8. Boeing, G. (2018) Measuring the Complexity of Urban Form and Design. Retrieved from  
<https://arxiv.org/ftp/arxiv/papers/1705/1705.01986.pdf>
9. Burke, S. (2016) Placemaking and the Human Scale City.  
<https://www.pps.org/article/placemaking-and-the-human-scale-city>
10. Budzynski, M., Gumińska, L., Jeliński, L. & Kieć, M. (2017) Pedestrian safety in road traffic – studies, recommendations and proposed improvements. Retrieved from  
[https://www.researchgate.net/publication/319052667\\_Pedestrian\\_safety\\_in\\_road\\_traffic\\_-\\_studies\\_recommendations\\_and\\_proposed\\_improvements](https://www.researchgate.net/publication/319052667_Pedestrian_safety_in_road_traffic_-_studies_recommendations_and_proposed_improvements)
11. Baobeid, A., Koç, M. & Al-Ghamdi, S. (2021) Walkability and Its Relationships With Health, Sustainability, and Livability: Elements of Physical Environment and Evaluation Frameworks. Retrieved from  
<https://www.frontiersin.org/articles/10.3389/fbuil.2021.721218/full>
12. Covert, M. (2014) Walkability and Disabilities. Retrieved from  
<https://1kfriends.org/walkability-disabilities/>
13. Donovan, L. (2018) Who benefits from accessible infrastructure? Retrieved from  
<https://policyoptions.irpp.org/fr/magazines/february-2018/who-benefits-from-accessible-infrastructure/>
14. El Messeidy, R. (2019) Towards Better Cities: Improving Walkability in Terms of Seven Principles. Retrieved from  
[https://www.researchgate.net/publication/341942138\\_Towards\\_Better\\_Cities\\_Improving\\_Walkability\\_in\\_Terms\\_of\\_Seven\\_Principles](https://www.researchgate.net/publication/341942138_Towards_Better_Cities_Improving_Walkability_in_Terms_of_Seven_Principles)
15. Elsheshtawy, Y. (1997) URBAN COMPLEXITY: TOWARD THE MEASUREMENT OF THE PHYSICAL COMPLEXITY OF STREET-SCAPES. Retrieved from  
<https://www.jstor.org/stable/43030433>
16. Ewing, R., Handy, S., Brownson, R. Clemente, O. & Winston, E. (2006) Identifying and Measuring Urban Design Qualities Related to Walkability. Retrieved from  
[https://activelivingresearch.org/sites/activelivingresearch.org/files/JPAH\\_15\\_Ewing.pdf](https://activelivingresearch.org/sites/activelivingresearch.org/files/JPAH_15_Ewing.pdf)

17. Ewing, R. & Handy, S. (2009) Measuring the Unmeasurable: Urban Design Qualities Related to Walkability. Retrieved from

[https://edisciplinas.usp.br/pluginfile.php/5068336/mod\\_resource/content/0/EwingHandy2009%20Measuring%20the%20Unmeasurable%20-%20Urban%20Design%20Qualities%20Related%20to.pdf](https://edisciplinas.usp.br/pluginfile.php/5068336/mod_resource/content/0/EwingHandy2009%20Measuring%20the%20Unmeasurable%20-%20Urban%20Design%20Qualities%20Related%20to.pdf)

18. Ernawati, J. (2016) Urban Design Qualities Related Walkability in a Commercial Neighbourhood. Retrieved from

[https://www.researchgate.net/publication/318652724\\_Urban\\_Design\\_Qualities\\_Related\\_Walkability\\_in\\_a\\_Commercial\\_Neighbourhood](https://www.researchgate.net/publication/318652724_Urban_Design_Qualities_Related_Walkability_in_a_Commercial_Neighbourhood)

19. Ernawati, J. & Surjono, S. (2018) People's Preferences of Urban Design Qualities for Walking on a Commercial Street. Retrieved from

[https://www.researchgate.net/publication/323802142\\_People's\\_Preferences\\_of\\_Urban\\_Design\\_Qualities\\_for\\_Walking\\_on\\_a\\_Commercial\\_Street](https://www.researchgate.net/publication/323802142_People's_Preferences_of_Urban_Design_Qualities_for_Walking_on_a_Commercial_Street)

20. Erkartal, O. & Uzunkaya, A. (2019) Transparency as a Component of Public Space. Retrieved from

<https://iopscience.iop.org/article/10.1088/1757-899X/471/9/092026/pdf>

21. Fu Glory, K.(2006) Urban Transparency. Retrieved from

<https://core.ac.uk/download/pdf/48536526.pdf>

22. Filomena, G., Verstegen, J. & Manley, E. (2019) A computational approach to 'The Image of the City'. Retrieved from

<https://www.sciencedirect.com/science/article/pii/S0264275118309776>

23. Florida, R. (2014) Walkability Is Good for You. Retrieved from

<https://www.bloomberg.com/news/articles/2014-12-11/walkability-is-good-for-you>

24. Forsyth, A. (2015). What is a walkable place? The walkability debate in urban design. Urban

Design International 20 (4): 274-292, Retrieved from

<http://nrs.harvard.edu/urn-3:HUL.InstRepos:29663388>.

25. Gress, D. (2015) URBAN DESIGN | THE HUMAN SCALE OF THE PUBLIC REALM. Retrieved from

<https://info.umkc.edu/63rd-st-studio/?p=887>

26. Gao, W, Qian, Y., Chen, H., Zhong, Z., Zhou, M. & Aminpour, F.(2022) Assessment of sidewalk walkability: Integrating objective and subjective measures of identical context-based sidewalk features. Retrieved from

<https://www.sciencedirect.com/science/article/abs/pii/S2210670722004553>

27. Hirschfeld, A. (2021) Urban Walkability Gains a Foothold in the U.S. Retrieved from

<https://www.yesmagazine.org/economy/2021/05/05/15-minute-city-walk>

28. Haughey, D. (2021) Delphi Technique a Step-by-Step Guide. Retrieved from

<https://www.projectsart.co.uk/tools/delphi-technique-a-step-by-step-guide.php>

29. Hirsch, J., Winters, M., Clarke, P., Ste-Marie, N., & McKaybgh, H. (2017) The influence of walkability on broader mobility for Canadian middle aged and older adults: An examination of Walk Score™ and the Mobility Over Varied Environments Scale (MOVES). Retrieved from

<https://www.sciencedirect.com/science/article/abs/pii/S0091743516303024>

30. Hartanti, N.(2020) The Walkability Of Street Corridors And Pedestrian Preferences In Jakarta Old City Heritage Area. Retrieved from

[https://www.researchgate.net/publication/342500278\\_The\\_Walkability\\_Of\\_Street\\_Corridors\\_And\\_Pedestrian\\_Preferences\\_In\\_Jakarta\\_Old\\_City\\_Heritage\\_Area](https://www.researchgate.net/publication/342500278_The_Walkability_Of_Street_Corridors_And_Pedestrian_Preferences_In_Jakarta_Old_City_Heritage_Area)

31. Jia, J., Kaw, J., Gapihan, A., Kim, S., Lozano, M., & Nitti, R.(2016) The “human scale” in public urban areas. Retrieved from

<https://blogs.worldbank.org/sustainablecities/human-scale-public-urban-areas>

32. Nunes, D. & Vale, D. (2015) PHYSICAL CHARACTERISTICS THAT INFLUENCE URBAN DESIGN QUALITIES OF LIVABLE AND WALKABLE URBAN PLACES: LESSONS FROM PORTUGUESE CITIES. Retrieved from

[https://www.researchgate.net/publication/281592365\\_PHYSICAL\\_CHARACTERISTICS\\_THAT\\_INFLUENCE\\_URBAN\\_DESIGN\\_QUALITIES\\_OF\\_LIVABLE\\_AND\\_WALKABLE\\_URBAN\\_PLACES\\_LESSONS\\_FROM\\_PORTUGUESE\\_CITIES](https://www.researchgate.net/publication/281592365_PHYSICAL_CHARACTERISTICS_THAT_INFLUENCE_URBAN_DESIGN_QUALITIES_OF_LIVABLE_AND_WALKABLE_URBAN_PLACES_LESSONS_FROM_PORTUGUESE_CITIES)

33. Mackey, C. (n,d) Conducting a Walk Audit. Retrieved from

<https://www.nchpad.org/1709/6826/Conducting~a~Walk~Audit>

34. Meyer, N. & Auriacombe, C. (2019) Good Urban Governance and City Resilience: An Afrocentric Approach to Sustainable Development. Retrieved from <https://www.mdpi.com/2071-1050/11/19/5514/htm>
35. Mateo-Babiano, I. (2016) The pedestrian decision making framework. Retrieved from [https://www.researchgate.net/figure/The-pedestrian-decision-making-framework\\_fig2\\_283825794](https://www.researchgate.net/figure/The-pedestrian-decision-making-framework_fig2_283825794)
36. Moskerintz, H. (2018) Urban Design Qualities to Encourage Walkability. Retrieved from <https://www.nar.realtor/blogs/spaces-to-places/urban-design-qualities-to-encourage-walkability>
37. Mutuku-kortbaek, A. (2016) In Search Of The Human Scale: Cities That Move At 5 Km/h, Instead Of At 60 Km/h. Retrieved from <https://arcspace.com/article/in-search-of-the-human-scale-cities-that-move-at-5-kmh-instead-of-at-60-kmh/>
38. Movahed, S., Payami, S. & Zakeri, H. (2012) A Safe Pedestrian Walkway; Creation a Safe Public Space Based on Pedestrian Safety. Retrieved from [https://www.researchgate.net/publication/257715454\\_A\\_Safe\\_Pedestrian\\_Walkway\\_Creation\\_on\\_a\\_Safe\\_Public\\_Space\\_Based\\_on\\_Pedestrian\\_Safety](https://www.researchgate.net/publication/257715454_A_Safe_Pedestrian_Walkway_Creation_on_a_Safe_Public_Space_Based_on_Pedestrian_Safety)
39. Mohamed, A., Kronenberg, J., & Laszkiewicz, E. (2022) Transport infrastructure modifications and accessibility to public parks in Greater Cairo. Retrieved from <https://www.sciencedirect.com/science/article/pii/S161886672200142X>
40. Ouchi, F. (2004) A Literature Review on the Use of Expert Opinion in Probabilistic Risk Analysis. Retrieved from [https://documents1.worldbank.org/curated/zh/346091468765322039/115515322\\_20041117173031/additional/wps3201Literature.pdf](https://documents1.worldbank.org/curated/zh/346091468765322039/115515322_20041117173031/additional/wps3201Literature.pdf)
41. Polonyi, T. (2022) Pedestrian Policy – How to Create a Walking Strategy for Your City. Retrieved from <https://citychangers.org/pedestrian-policy/>
42. Paykoç, E. (2018) Walkability as an Urban Indicator for a Sustainable Built Environment. Retrieved from

<https://www.researchgate.net/publication/354204199>

43. Radwan, A. & Morsi, A. (2019) The Human Scale in Public Spaces. An Analytical Study of New Cairo Settlements. Retrieved from

[https://www.researchgate.net/publication/336049527\\_The\\_Human\\_Scale\\_in\\_Public\\_Spaces\\_An\\_Analytical\\_Study\\_of\\_New\\_Cairo\\_Settlements](https://www.researchgate.net/publication/336049527_The_Human_Scale_in_Public_Spaces_An_Analytical_Study_of_New_Cairo_Settlements)

44. Riddle, D. (2019) How Far Can You Walk? Hidden Mobility Disabilities and Community Participation. Retrieved from

<https://hiddenmobilitydisabilities.com/wp-content/uploads/2019/03/HMD-and-Community-Participation.article.pdf>

45. Robbins, A. (2017) Research: Walkability makes a street more “complete”. Retrieved from

<https://mobilitylab.org/2017/11/08/research-walkability-makes-street-complete/>

46. Ryals, L.& Wilson, H. (2005) Experimental Methods in Market Research: From Information to Insight. Retrieved from

[https://www.researchgate.net/publication/279701781\\_Experimental\\_Methods\\_in\\_Market\\_Research\\_From\\_Information\\_to\\_Insight](https://www.researchgate.net/publication/279701781_Experimental_Methods_in_Market_Research_From_Information_to_Insight)

47. Silvaa, B., Khan, M. & Han,K. (2018) Towards sustainable smart cities: A review of trends, architectures, components, and open challenges in smart cities. Retrieved from

<https://www.sciencedirect.com/science/article/abs/pii/S2210670717311125>

48. Stathi, A. (2009) The International Universities Walking Project: development of a framework for workplace intervention using the Delphi technique. Retrieved from

[https://www.academia.edu/10334584/The\\_International\\_Universities\\_Walking\\_Project\\_development\\_of\\_a\\_framework\\_for\\_workplace\\_intervention\\_using\\_the\\_Delphi\\_technique](https://www.academia.edu/10334584/The_International_Universities_Walking_Project_development_of_a_framework_for_workplace_intervention_using_the_Delphi_technique)

49. Singh, R. (2016) Factors affecting walkability of neighborhoods. Retrieved from

<https://pdf.sciencedirectassets.com/277811/1-s2.0-S1877042816X0002X/1-s2.0-S187704281506228X/main.pdf?X-Amz-Security->

50. Tiwari, R.(2014) Designing a Safe Walkable City. Retrieved from

[https://www.researchgate.net/publication/264534543\\_Designing\\_a\\_Safe\\_Walkable\\_City](https://www.researchgate.net/publication/264534543_Designing_a_Safe_Walkable_City)

51. Zegeer, C., Sandt, L. & Scully, M.(2006) How to Develop a Pedestrian Safety Action Plan. Retrieved from

[https://safety.fhwa.dot.gov/ped\\_bike/ped\\_focus/docs/fhwasa0512.pdf](https://safety.fhwa.dot.gov/ped_bike/ped_focus/docs/fhwasa0512.pdf)

52. Zegeer, C. (1998) Design and Safety of Pedestrian Facilities. Retrieved from

[https://safety.fhwa.dot.gov/ped\\_bike/docs/designsafety.pdf](https://safety.fhwa.dot.gov/ped_bike/docs/designsafety.pdf)

53. Zuniga-Teran, A., Orr, B., Gimblett, R., Chalfoun, N., Marsh, S., Guertin, D. & Going, S. (2017) Designing healthy communities: Testing the walkability model. Retrieved from

<https://www.sciencedirect.com/science/article/pii/S2095263516300656>