International Journal of Architecture and Urbanism Vol. 10, No. 02 (2026) 223 – 238

International Journal of Architecture and Urbanism

Journal homepage: https://talenta.usu.ac.id/ijau

Measuring and Improving Walkability in Urban Historical Tourism Area: A Case Study in Medan

Firman Eddy*[1], Wahyu Abdillah[1], Novrial[1], Aulia Malik Affif[1]

[1]*Department of Architecture, Faculty of Engineering, Universitas Sumatera Utara, Medan, 20155, Indonesia*

*Corresponding Author: rechvidimaz@yahoo.com

ARTICLE INFO

Article history:
Received 3 June 2025
Revised 23 December 2025
Accepted 30 June 2026
Available online 30 August 2026

E-ISSN: 2622-1640
P-ISSN: 2622-0008

How to cite:
Eddy F, et al. Measuring and Improving Walkability in Urban Historical Tourism Area: A Case Study in Medan. International Journal of Architecture and Urbanism. 2026. 10(2): 223-238.

http://doi.org 10.32734/ijau.v10i2.27128

ABSTRACT

Medan is the largest city on Sumatera Island and the capital city of North Sumatera. The main tourist attractions are in the downtown area, which is located in the Kesawan corridor, around Lapangan Merdeka, Maimun Palace, and the Al Mashun Grand Mosque. However, there is still no adequate walking environment that connects those areas which resulting in very little walking activity. This research aims to to assess the current condition of the walking environment and develop a design model in order to enhance walkability in the historic tourism areas of Medan. The authors undertake a field survey as well as collect the pedestrians preference regarding the walkway. The final walkability score of the research locations are 58,8. The authors proposed five model recommendation to improve the walkway in the research locations, namely: (1) Walkway amenities improvement; (2) CPTED design application in the walkway; (3) Implementation of pelican crossing; (4) Signage and speed bump application; and (5) Ramp and S portal barrier application. The authors believed the proposed model recommendations are sufficient to enhance the walkability in the research locations.

Keywords: global walkability index, historical tourism, Medan, pedestrian infrastructure, walkability

1. Introduction

Tourism plays an important role in supporting economic growth, particularly by increasing employment opportunities, generating public revenue, and encouraging business development, especially in developing countries such as Indonesia [1][2]. Among various forms of tourism, historical tourism has become one of the most attractive types because it offers cultural, architectural, and educational value to visitors [2]. Medan, the capital city of North Sumatera and the largest city on Sumatera Island, has significant potential as a historical tourism destination. Several major tourist attractions are located in the downtown area, particularly along the Kesawan corridor, around Lapangan Merdeka, Maimun Palace, and the Al Mashun Grand Mosque. These attractions represent important historical periods, including the Dutch colonial era in the early twentieth century and the Deli Sultanate period in the eighteenth century. Since these destinations are located within an approximately two-kilometre radius, they have strong potential to be connected through a comfortable and integrated pedestrian network.

Walking is one of the most common daily physical activities and supports various purposes, including mobility, exercise, recreation, sightseeing, and tourism activities [3][4]. As a sustainable mode of movement, walking can also contribute to environmental improvement by reducing dependence on motorized transport, decreasing

the demand for road and parking space, and lowering energy consumption and pollution [5][6]. However, in many Indonesian cities, people tend to prefer private vehicles or other motorized modes rather than walking [7]. Wibowo et al. [4] argued that this tendency is closely related to the inadequate quality of pedestrian infrastructure and walking environments. A similar condition can be observed in Medan, where residents and visitors often rely on private vehicles, online taxis, or other forms of motorized transport, which may contribute to traffic congestion, air pollution, and unsustainable urban mobility patterns [7]. This problem is also evident in Medan's historical tourism areas. In the Kesawan area and its surrounding tourism corridors, pedestrian facilities are not yet well planned, continuous, or fully integrated with other modes of transportation [8]. As a result, walking activity remains relatively low, even though the distance between major tourist destinations is suitable for pedestrian movement. Tourists who visit the area often prefer motorized transportation because the existing walking environment does not yet provide sufficient comfort, safety, accessibility, and continuity.

A walkable environment is an important factor in strengthening the attractiveness of tourism destinations [1]. The planning of pedestrian-friendly environments can improve comfort and is directly associated with an increase in pedestrian activity [9]. Therefore, improving walkability in tourism areas is essential for supporting tourism development, enhancing visitor experience, and encouraging sustainable urban mobility. In recent years, pedestrian-oriented urban planning and design have received increasing attention from practitioners, academics, and governments involved in discussions on urban sustainability, particularly because such approaches respond to the needs, behaviour, and perceptions of pedestrians [10].

Walkability refers to the quality, connectivity, and accessibility of pedestrian facilities, including sidewalks, footpaths, and other walking networks [11]. Southworth [9] defined walkability as the extent to which the built environment supports and encourages walking by providing comfort, safety, connectivity, reasonable travel distance, and visual interest along pedestrian routes. A well-connected pedestrian network, supported by accessible public transportation, can create more opportunities for tourism activities because visitors are able to move between destinations on foot while experiencing the urban environment more directly [12]. In a broader urban context, walkable cities can increase land value, generate economic activity, bring people back to public spaces, and create safer, healthier, and more vibrant communities [13][14]. Walkable urban environments may also reduce environmental impacts while improving the physical and mental health of residents and visitors [15]. For this reason, one of the current priorities in urban development is the improvement of areas that support pedestrians and cyclists while reducing dependence on motorized vehicles [16]. To evaluate the quality of pedestrian environments, the Global Walkability Index (GWI) can be used as an assessment method. The GWI was developed by Krambeck for the World Bank and is used to measure the quality of walking environments through several indicators related to safety, security, comfort, and pedestrian facility conditions [11]. In the Asian urban context, the GWI provides a useful framework for identifying the quality of pedestrian paths and determining the need for pedestrian infrastructure improvement [11]. Previous studies have also shown that the GWI can support both qualitative and quantitative analysis of walkability conditions, particularly in relation to pedestrian safety, security, and comfort [7].

As a major urban centre in western Indonesia, Medan has substantial potential to attract more tourists through improved historical tourism management and pedestrian-oriented urban design. However, the lack of adequate pedestrian connectivity between Kesawan, Lapangan Merdeka, Maimun Palace, and the Al Mashun Grand Mosque remains a key issue that limits walking activity in the area. Based on this problem, this study aims to assess the existing condition of the walking environment and to develop design recommendations for improving walkability in Medan's historical tourism area. The study specifically addresses two main questions: how walkable is the existing pedestrian environment in Medan's historical tourism corridor, and what design strategies can be proposed to improve walkability based on field assessment and pedestrian preferences? The findings are expected to provide a practical foundation for improving pedestrian infrastructure, supporting tourism activities, and offering useful references for local government, practitioners, and academics.

2. Method

This study employed a mixed-method approach combining a structured field walkability audit and a pedestrian questionnaire survey. The field audit was used to assess the physical and environmental quality of pedestrian facilities, while the questionnaire survey was conducted to obtain pedestrians' perceptions, travel behaviour, and preferences for walkway improvement. The combination of these two methods was intended to provide both objective and user-based evidence for formulating walkability improvement recommendations in Medan's historical tourism area. The study was conducted in Medan City, North Sumatera, Indonesia, focusing on the main historical tourism corridor that connects several important destinations, including Al Mashun Grand Mosque, Maimun Palace, the Kesawan corridor, Lapangan Merdeka, and Kantor Pos. As shown in Figure 1, the study area extends from Al Mashun Grand Mosque in the southern part of the corridor to Kantor Pos in the northern part. The corridor was divided into five observation segments to allow a more detailed and comparable assessment of pedestrian conditions. These segments consist of the Mesjid Raya corridor, Brigjen Katamso corridor, Pemuda corridor, Ahmad Yani corridor, and the corridor around Lapangan Merdeka. The approximate length of each segment is presented in Table 1.

Figure 1. Research location

Table 1. Research Location

Research Location	Total Length (approx.)
Mesjid Raya corridor	325 meters
Brigjen Katamso corridor	750 meters
Pemuda corridor	415 meters
Ahmad Yani corridor	690 meters
corridor around Lapangan Merdeka	1.050 meters

Walkability was assessed using the Global Walkability Index (GWI), which was developed to evaluate the quality of pedestrian environments based on safety, security, comfort, and infrastructure conditions [11]. This study adopted the GWI parameters modified by Leather et al. [11] for Asian cities because the indicators are relevant to the pedestrian conditions commonly found in dense urban areas in developing countries. The GWI consists of nine parameters: walking path modal conflict, availability of walking paths, availability of crossings, grade crossing safety, motorist behaviour, amenities, disability infrastructure, obstructions, and

security from crime. The parameters, descriptions, and respective weights used in the assessment are presented in Table 2.

Table 2. GWI elements

Parameter	Description	Weight
Walking path modal conflict	The extent of conflict between pedestrians and other modes such as bicycles, motorcycles, and cars on the roads.	15%
Availability of walking paths	Reflects the need for, availability and condition of walking paths.	25%
Availability of crossings	The availability and distances between crossings to describe whether pedestrians tend to jaywalk when there are no crossings or when the distances between crossings are too long.	10%
Grade crossing safety	This refers to the exposure of pedestrians to other modes while crossing, the time spent waiting and crossing the street and the sufficiency of time given to pedestrians to cross signalized intersections	10%
Motorist behaviour	The behavior of motorists towards pedestrians, which may well indicate the kind of pedestrian environment there is in that area.	5%
Amenities	The availability of pedestrian amenities such as benches, street lights, public toilets and trees. These amenities enhance the attractiveness and convenience of the pedestrian environment and in turn, the city itself.	10%
Disability infrastructure	The availability, positioning and maintenance of	10%
Obstructions	The presence of permanent and temporary obstructions on the pedestrian pathways. These ultimately affect the effective width of the pedestrian pathway and may cause inconvenience to the pedestrians.	10%
Security from Crime	The general feeling of security from crime in the street.	5%

The field walkability audit was conducted through direct observation along each of the five corridor segments. Each GWI parameter was evaluated based on the actual condition of the pedestrian environment, including sidewalk continuity, pavement condition, crossing availability, traffic exposure, driver behaviour, street amenities, accessibility facilities, physical obstructions, and perceived security. The field assessment used a five-point rating scale, where 1 represented the lowest condition and 5 represented the highest condition. The rating was then converted into a 0–100 scale to enable comparison across parameters and corridor segments. Higher scores indicate better walkability conditions. The score for each parameter was multiplied by its assigned weight, as listed in Table 2. The weighted scores were then summed to obtain the final walkability score for each corridor segment. The calculation was conducted using the following equation:

Where WSj is the walkability score of corridor segment j, Sij is the converted score of parameter i in corridor segment j, and Wi is the weight assigned to parameter i. After the score for each corridor segment was obtained, the overall walkability score of the study area was calculated by averaging the five corridor scores. The final score was then classified using the walkability classification developed by Gota er al. For the Clean Air Invitative dor Asia Cities [17], as presented in Table 3. Based on this classification, scores between 0 and 50 are categorized as “not walkable,” scores between 51 and 70 are categorized as “waiting to walk,” and scores between 71 and 100 are categorized as “highly walkable.”

Table 3. Walkability classification

Score Range	Category
0-50	Not walkable
51-70	Waiting to walk
71 - 100	Highly walkable

In addition to the field audit, a pedestrian questionnaire survey was conducted to capture user perceptions and preferences regarding the walking environment. A total of 100 pedestrians were surveyed across the five corridor segments. The questionnaire consisted of three main parts. The first part recorded respondents' socio-demographic characteristics, including gender, age group, income level, and walking purpose. The second part examined respondents' travel behaviour, including their main daily mode of transportation, average walking duration, and estimated travel distance. The third part asked respondents to evaluate the overall condition of the walking environment and to identify priority aspects for walkway improvement.

The questionnaire data were analysed using descriptive statistics, particularly frequency and percentage distributions. Respondents' improvement preferences were assessed based on priority ranking, allowing the study to identify which aspects of the walking environment were considered most urgent by pedestrians. The questionnaire results were not used to replace the GWI field assessment, but rather to complement and validate the interpretation of field findings. Therefore, the final design recommendations were developed by integrating three sources of evidence: the GWI-based field audit, the walkability classification results, and pedestrian preferences obtained from the questionnaire survey. The formulation of the walkability improvement model was based on the lowest-scoring GWI parameters, the observed physical problems in each corridor, and the priority improvements identified by pedestrians. This process ensured that the proposed recommendations were not only derived from technical assessment but also reflected the needs and perceptions of pedestrian users. The resulting recommendations were then translated into design strategies for improving pedestrian safety, comfort, accessibility, continuity, and security in Medan's historical tourism corridor.

3. Result and Discussion

The field walkability assessment indicates that the historical tourism corridor of Medan has the basic physical potential to support pedestrian movement, but the existing pedestrian environment remains uneven in quality, continuity, accessibility, and safety. The assessment across five corridor segments shows that most pedestrian paths are physically available; however, the presence of obstructions, limited crossing facilities, insufficient disability infrastructure, unsafe motorist behaviour, and inadequate amenities reduces the overall walkability performance of the area. This condition confirms that walkability is not determined only by the existence of sidewalks, but also by the degree to which the pedestrian environment provides safety, comfort, accessibility, continuity, and security, as emphasized in walkability studies and the Global Walkability Index framework [7][11][17].

In the Mesjid Raya corridor, the field survey shows that pedestrian paths are generally available, but their quality is reduced by damaged pavement, vehicle encroachment, street vendors, and informal activities along the sidewalk. The radar diagram in Figure 2 illustrates that this corridor performs relatively better in the availability of walking paths but remains weak in amenities, disability infrastructure, obstructions, and crossing facilities. The photographic documentation in Figure 3 further confirms that parts of the walkway are affected by physical deterioration and informal use, which limits pedestrian comfort and effective walking width. Although the corridor has a relatively active urban environment from day to night, which can improve perceived security, the lack of supporting street furniture and universal access facilities weakens its function as a pedestrian route serving a major historical and religious tourism destination.

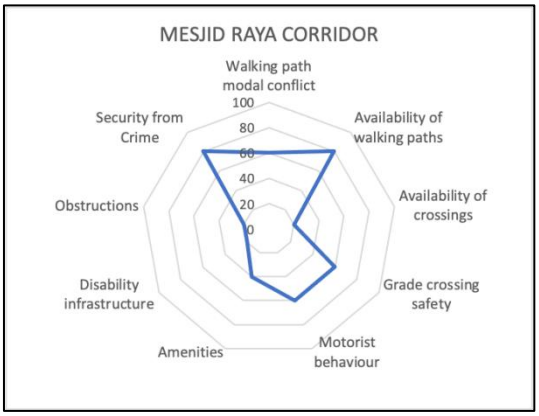


Figure 2. Mesjid Raya Corridor field survey

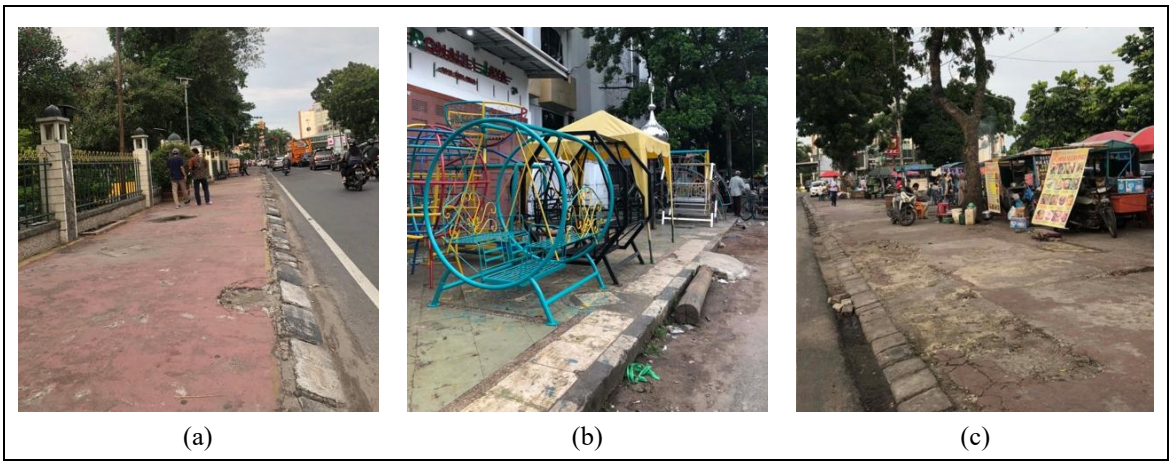
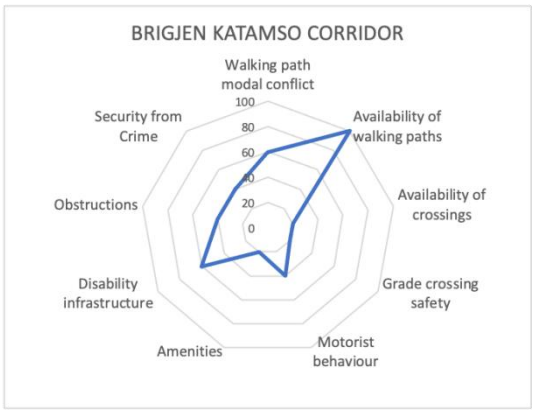
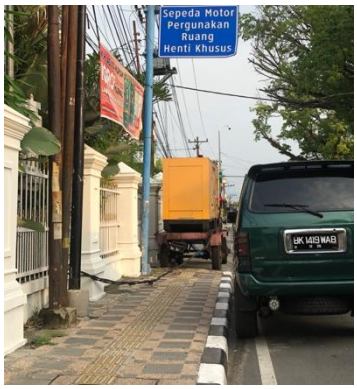


Figure 3. Mesjid Raya Corridor field survey

The Brigjen Katamso corridor demonstrates a different but related set of problems. As shown in Figure 4, the corridor has a continuous pedestrian path, but several walkability parameters remain low, particularly grade crossing safety, motorist behaviour, amenities, and obstructions. The field photographs in Figure 5 show that street vendors, motorcycle parking, electricity generators, and building ramps or stairs occupy parts of the sidewalk. These conditions reduce the effective width of the walkway and interrupt pedestrian movement. Although the sidewalk is generally in good physical condition and includes tactile paving in some sections, the absence of adequate ramps limits accessibility for wheelchair users. The limited number of crossings along the approximately 750-meter corridor also exposes pedestrians to traffic risk, particularly because motorcycles and angkutan kota frequently operate in ways that reduce pedestrian safety. This finding supports the argument that pedestrian infrastructure must be evaluated not only through physical availability but also through its interaction with traffic behaviour and street-level activities [11]. The Pemuda corridor performs better than several other segments because the walking path is relatively continuous, in good condition, and less obstructed. Figure 6 indicates that the corridor has stronger performance in walking path availability and lower obstruction levels compared with other segments. The field conditions shown in Figure 7 also demonstrate that the walkway is generally usable, although motorcycle parking and building entrances still create potential conflicts between pedestrians and vehicles. The presence of tactile paving and ramps is a positive feature; however, some ramps appear too steep for comfortable wheelchair use. This indicates that the presence of disability infrastructure alone is insufficient if its design does not meet appropriate accessibility standards. Motorist behaviour remains a concern in this corridor, as reckless driving and vehicle access points increase the risk of pedestrian–vehicle conflict.





(a) (b) (c)

Figure 5. Brigjen Katamso Corridor field survey

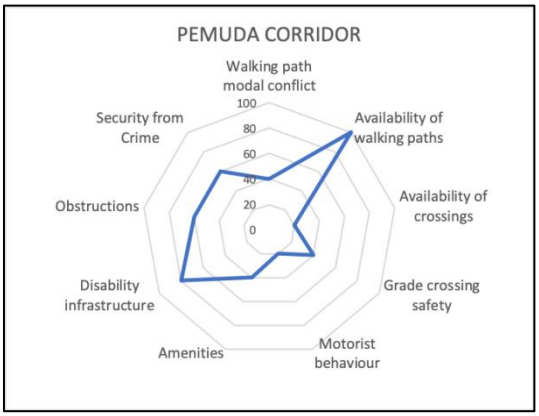
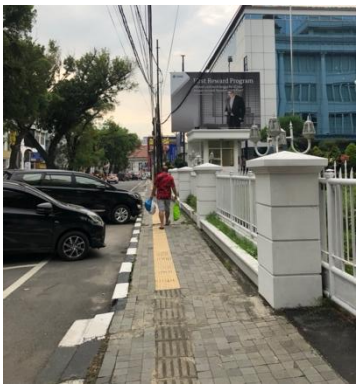


Figure 6. pemuda corridor field survey



(a) (b) (c)

Figure 7. Pemuda Corridor Field Survey

The Ahmad Yani corridor presents a more complex walkability condition. As illustrated in Figure 8, the corridor has adequate walking path availability but lower performance in crossing availability, motorist behaviour, disability infrastructure, and security from crime. The field photographs in Figure 9 show that some parts of the walkway are narrowed by poles, building edges, and other physical obstructions, reducing the effective width to approximately 30–35 cm in certain locations. Although some sections are equipped with benches, hedges, litter bins, street lighting, and sculptural elements, these amenities are not evenly distributed along the corridor. The lack of ramps also reduces accessibility for wheelchair users. In addition, low evening activity and the presence of homeless people sleeping in some areas may reduce pedestrians' perceived security. From an urban design perspective, this corridor illustrates the need for integrated pedestrian improvement that combines physical upgrading, traffic management, social activity activation, and environmental safety strategies.

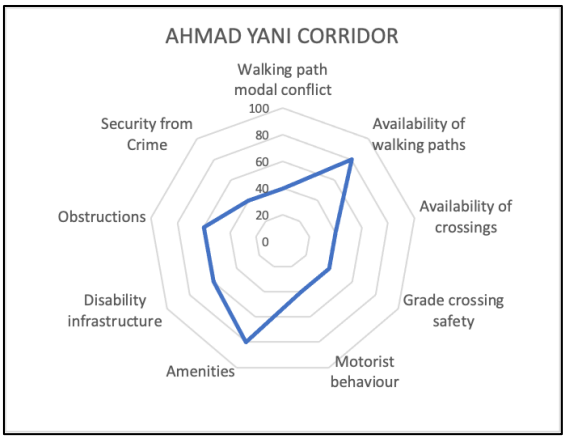


Figure 8. Ahmad Yani Corridor field survey

Figure 9. Ahmad Yani Corridor field survey

The corridor around Lapangan Merdeka records the strongest walkability performance among the five study segments. Figure 10 shows that this corridor performs relatively well in walking path availability, amenities, and security from crime. The field photographs in Figure 11 indicate that the walkway is generally wider, ranging from approximately 2 to 3 meters and reaching 4.5 meters at certain points. The corridor is also supported by benches, street lights, litter bins, trees, and hedges, which contribute to pedestrian comfort and environmental quality. Nevertheless, the corridor still faces several problems, including limited crossing facilities, the absence of adequate ramps, motorcycle parking, and street vendors occupying parts of the pedestrian path. Therefore, although this corridor is categorized as the most walkable segment, it still requires targeted improvement to ensure inclusive access, uninterrupted movement, and safer crossing conditions. The overall walkability score confirms that the study area is not yet fully pedestrian-oriented. As presented in Table 4, the corridor around Lapangan Merdeka obtained the highest score of 71 and was categorized as "highly walkable," while the Mesjid Raya, Brigjen Katamso, Pemuda, and Ahmad Yani corridors scored 52, 54, 59,

and 58, respectively, placing them in the "waiting to walk" category. The overall score of 58.8 indicates that the historical tourism corridor has moderate walkability but still requires substantial improvement before it can function as a comfortable, safe, and attractive pedestrian tourism network. Compared with the previous walkability study in Kampung Madras, Medan, which reported a lower walkability score of 44.4, the present study area performs better, but its classification still shows that pedestrian conditions remain below an optimal standard [7].

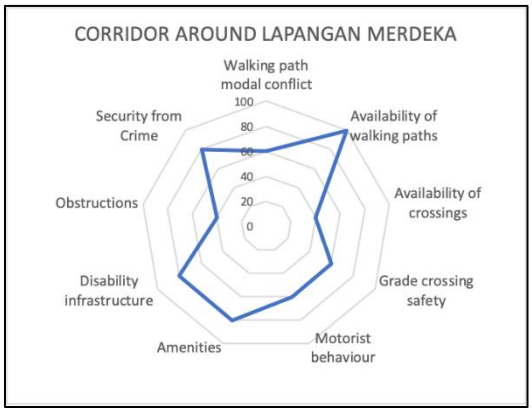
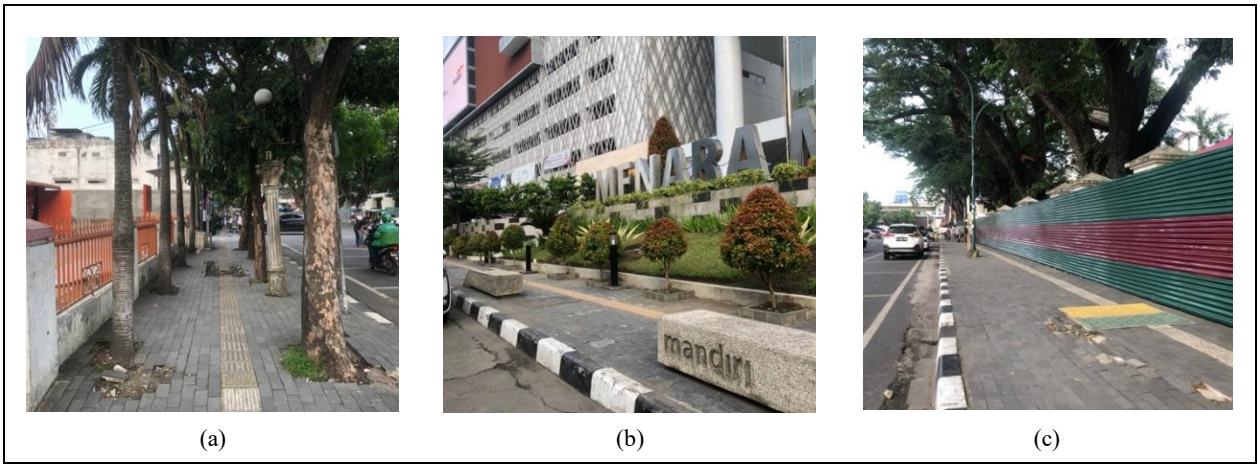


Figure 10. Corridor around Lapangan Merdeka field survey



(a) (b) (c)

Figure 11. Corridor around Lapangan Merdeka field survey

Table 4. Walkability score

Research Location	Walkability Score	Category
Mesjid Raya corridor	52	Waiting to walk
Brigjen Katamso corridor	54	Waiting to walk
Pemuda corridor	59	Waiting to walk
Ahmad Yani corridor	58	Waiting to walk
corridor around Lapangan Merdeka	71	Highly walkable
Overall	**58,8**	

The parameter-based assessment presented in Table 5 provides a clearer explanation of the weaknesses affecting the overall score. The highest average score was found in the availability of walking paths, with a score of 92, indicating that sidewalks are generally provided across the study area. However, the lowest score was found in the availability of crossings, with a score of 28, showing that safe and convenient pedestrian crossing facilities are still inadequate. Other weak parameters include grade crossing safety, motorist behaviour, and obstructions, each reflecting the interaction between pedestrians, vehicles, and informal street

activities. These findings show that the main walkability challenge in Medan's historical tourism corridor is not the absence of sidewalks, but the lack of a continuous, safe, accessible, and well-managed pedestrian system. This finding is also consistent with the broader understanding that pedestrian quality in Asian cities is often constrained by traffic conflict, poor crossing facilities, sidewalk obstruction, and weak enforcement [11], [17].

Table 5. Avg. walkability parameters score and recommendation

Parameter	Avg. Score	Recommendation
Walking path modal conflict	52 (fair)	There were not many conflicts in the walkway, which were primarily caused by the building's vehicle entrance. Physical infrastructure, such as bollards or vegetation are required to prevent conflict.
Availability of walking paths	92 (very good)	Overall, the walkway is already provided, but in a few locations, many of the walkways have been damaged, primarily as a result of vehicle parking and passing by. The use of stronger materials and bollards may reduce the risk of damage.
Availability of crossings	28 (poor)	Inadequate amount of crossing facility in all locations. Increased crossing facilities, such as the Pelican crossing, which is equipped with a crossing call button, could provide solutions.
Grade crossing safety	44 (fair)	When crossing the street, pedestrians are often exposed to other vehicles. There are preventative measures that can be used, such as speed bumps and speed limit signage
Motorist behaviour	44 (fair)	*Angkutan Kota* and motorcycle drivers perform dangerous driving. Regulating maximum speed in the area is needed with the addition of build speed bump in the road.
Amenities	52 (fair)	All locations have street lights and trees, but most lack other street furniture. It is necessary to improve walkway amenities such as signage, benches, litter bins, hedges, and so on.
Disability infrastructure	60 (fair)	Braille tactile paving is already equipped in most locations. However, only few locations are providing ramp despite being too steep for wheelchair. Build a modest ramp may increase the walking experience.
Obstructions	44 (fair)	Many obstructions come from motorcycle parking and street vendors. As a result, there is a need to manage the motorcycle parking area and street vendors so that they do not disrupt the walkway width.
Security from Crime	60 (fair)	There are numerous occasion where crime occurs in the walkway despite. The walkway, on the other hand, could be designed with the concept of crime prevention through environmental design (CPTED), such as adding CCTVs, improving street lighting, and increasing territoriality.

The pedestrian questionnaire survey provides additional evidence that supports the field assessment. Figure 12 shows the profile of the 100 respondents, with 59% female and 41% male respondents. Most respondents were aged between 15 and 30 years, followed by those aged 30 to 45 years and above 45 years. The majority of respondents also had monthly income below the Medan Regional Minimum Wage. In terms of walking purpose, the largest group walked for work, school, or college, followed by eating, passing through the area, sightseeing, tourism, leisure, other purposes, and shopping. These results indicate that the corridor is used not only by tourists but also by local residents and daily users, meaning that walkability improvement should address both tourism experience and everyday mobility needs. The travel behaviour data shown in Figure 13 further reveal that dependence on motorized transport remains high. Most respondents used motorcycles as their main daily mode of transportation, followed by public transportation, private cars, online taxis, walking, and cycling. The majority of respondents walked less than 15 minutes per day, and most reported an average travel distance of less than 1.5 km. This pattern suggests that the area has the spatial potential for walking because many trips are relatively short, but the existing pedestrian environment does not yet provide sufficient incentives for people to choose walking as a primary mode of movement. This result is consistent with previous

findings that poor pedestrian infrastructure and walking environments contribute to low walking activity in Indonesian cities [4][7].

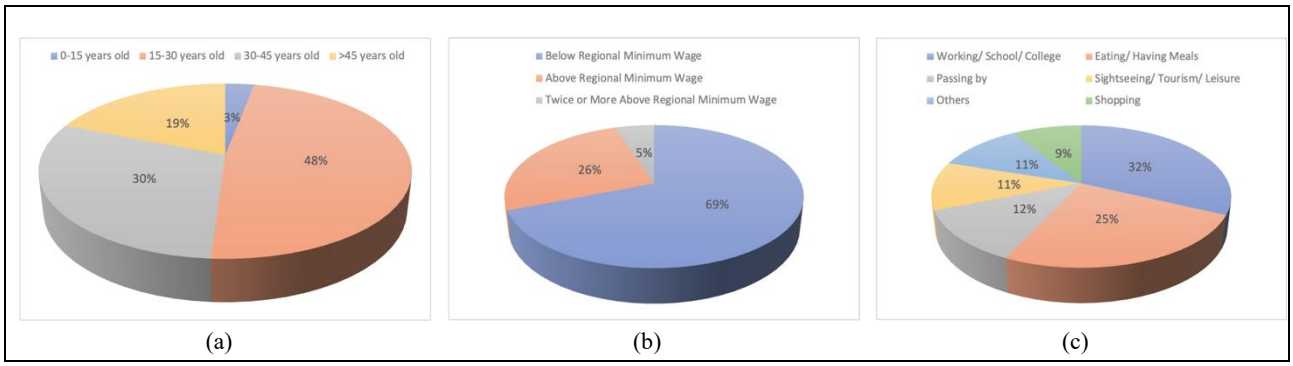


Figure 12. Respondents profile

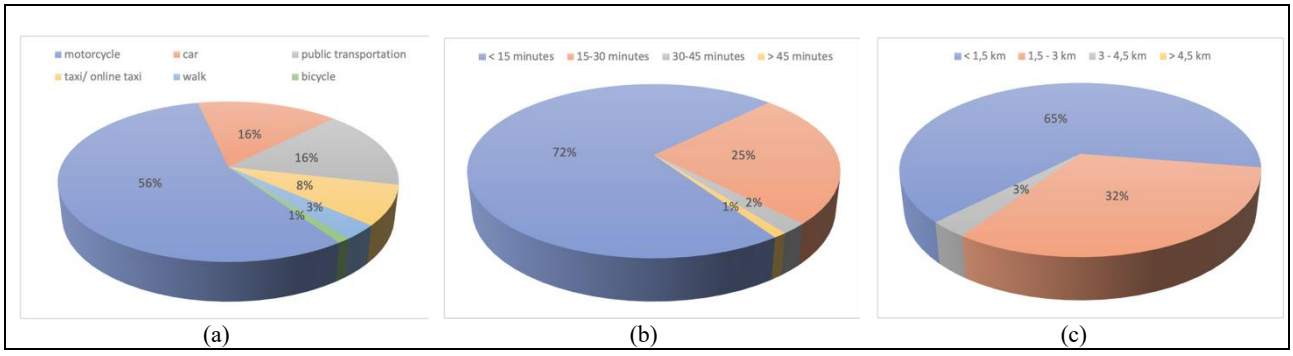


Figure 13. Respondents travel behavior

Respondents' evaluation of walkway conditions also supports the field findings. As shown in Figure 14, three-quarters of respondents rated the walking environment as fair, while smaller proportions rated it poor, very poor, good, or very good. The same figure also shows that the most urgent improvement priority was the removal of obstacles from the walkway, including street vendors and parking. Safety and security were also identified as major concerns, followed by the improvement of walkway amenities such as benches, trees, and litter bins. Interestingly, reducing and slowing traffic received lower priority from respondents, although the field assessment showed that motorist behaviour and grade crossing safety remain significant technical problems. This difference suggests that users may perceive sidewalk obstruction more directly during walking, while traffic risk may be normalized in daily urban experience. Therefore, design recommendations should not rely solely on user preference but should integrate both user perception and technical safety assessment.

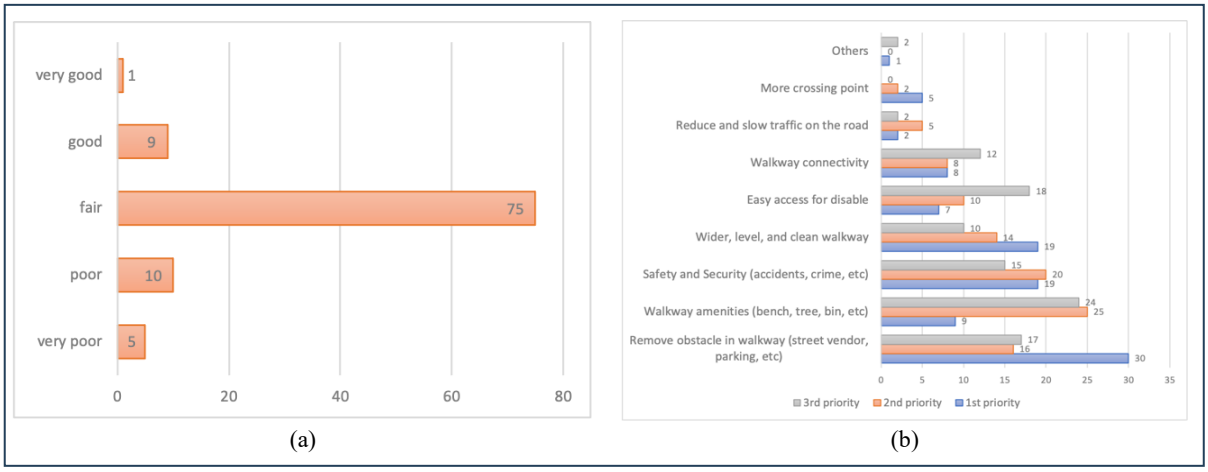


Figure 14. Respondents rating of walkway and improvement preference

Based on the combined results of the field audit and pedestrian questionnaire, the first improvement strategy is to enhance walkway width, continuity, surface quality, and amenities. Figure 15 illustrates the proposed

improvement of pedestrian amenities, including benches, litter bins, bollards, street lighting, and vegetation. The proposed walkway width of approximately 2.5 to 3.5 meters would provide a more comfortable walking space and reduce conflict between pedestrians and surrounding activities. Bollards and vegetation can prevent vehicles from entering the pedestrian path, while durable, firm, anti-slip, and relatively rough pavement materials can improve safety and usability. This recommendation is consistent with previous research emphasizing the importance of appropriate walkway material and physical quality in supporting pedestrian movement [18]. The design approach also responds to the respondent preference for removing obstructions and improving amenities, as shown in Figure 14. The second strategy is the application of Crime Prevention Through Environmental Design (CPTED) principles. Figure 16 presents the proposed CPTED-based design, which includes clearer access control, improved surveillance, pedestrian-level lighting, CCTV placement, vegetation buffers, and stronger territorial definition between pedestrian and vehicular spaces. This recommendation is important because several corridors recorded only fair scores for security from crime, and safety and security were among the main concerns identified by respondents. CPTED has been widely discussed as an effective environmental design approach for reducing safety-related incidents in public infrastructure and urban spaces [19][20]. In the context of Medan's historical tourism corridor, CPTED can support both pedestrian safety and the protection of adjacent buildings and parking areas [21]. However, its implementation should be integrated with active street frontage, maintenance, lighting management, and local security coordination to avoid relying solely on surveillance devices.

(a) (b)

Figure 15. Walkway amenities improvement

Figure 16. CPTED design

The third strategy is the provision of safer pedestrian crossing facilities. Figure 17 illustrates the proposed pelican crossing, which is relevant because crossing availability received the lowest average parameter score in Table 5. The lack of safe crossings forces pedestrians to cross at informal or unsafe points, increasing exposure to traffic risk. Pelican crossings equipped with pedestrian call buttons can provide a clearer and safer crossing opportunity, especially in corridors with high pedestrian demand and vehicle movement. The placement of these crossings should be based on observed pedestrian desire lines, destination nodes,

intersection spacing, and traffic volume. This recommendation is also aligned with the use of walkability assessment tools in identifying priority areas for pedestrian facility improvement, as shown in previous urban walkability research [11][17][22].

Figure 17. Pelican crossing

The fourth strategy concerns traffic calming through the use of speed bumps and warning signage. Figure 18 shows the proposed application of speed bumps and pedestrian warning signs before crossing points. This intervention is necessary because motorist behaviour and grade crossing safety were among the weaker parameters in the field assessment. Traffic calming can reduce vehicle speed, increase driver awareness, and improve pedestrians' perceived and actual safety when crossing the street. Previous research has shown that lower vehicle speed and safer street environments contribute to better pedestrian safety and comfort [23]. In the Medan context, this strategy is particularly relevant for corridors where motorcycles and angkutan kota frequently drive aggressively or stop unpredictably. The final strategy is the provision of accessible ramps and S-portal barriers. Figure 19 illustrates the proposed ramp and S-portal barrier design, which aims to improve access for wheelchair users while preventing motorcycles from entering the pedestrian path. This recommendation responds directly to the limited disability infrastructure observed in most corridors. Although tactile paving exists in several locations, ramps are absent or too steep in many segments, meaning that the pedestrian environment is not yet inclusive. The S-portal barrier can serve as an alternative to conventional bollards because it restricts motorcycle access while still allowing wheelchair movement. Nevertheless, the design must be carefully dimensioned to ensure that it does not create a new obstruction for people with disabilities, older adults, children, or pedestrians carrying goods.

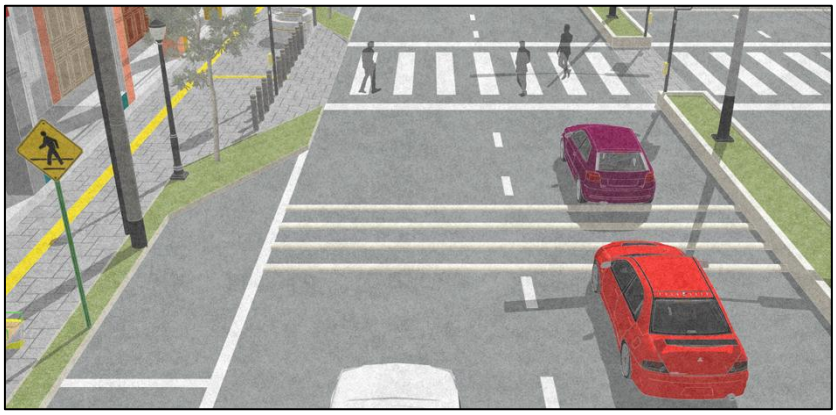


Figure 18. Signage and speed bump

Figure 19. Ramp and S portal barrier

The results demonstrate that Medan's historical tourism corridor has a moderate level of walkability and considerable potential for improvement. The main strengths of the study area are the availability of pedestrian paths and the presence of several active historical destinations within a walkable distance. However, the main weaknesses are unsafe crossings, vehicle conflicts, sidewalk obstructions, incomplete accessibility infrastructure, inconsistent amenities, and uneven perceived security. The integration of the GWI field audit, pedestrian perception survey, and design recommendations provides a comprehensive basis for improving the corridor. Nevertheless, the proposed model should be understood as a design recommendation rather than a verified intervention. Further research should test the effectiveness of the proposed strategies through expert validation, pedestrian simulation, before-and-after evaluation, or pilot implementation in selected corridor segments.

4. Conclusion

The final walkability score of the research locations are 58,8. Compared with other location in Medan such as a commercial area in Kampung Madras which only scored 44,4 which previously studied by Affif [7], the walkability score in this research area gets a higher rating. There has been a good effort by the government to improve the walkway in these locations, despite there are numerous issues regarding the walkway that need to be improved. According to the pedestrians survey, three quarters of respondents categorized the walkway in fair category. Most pedestrians believe that improving the walkway's obstructions, such as street vendors and motorcycle parking, is a main priority. However, improving walkability, according to Shaaban [24], is a difficult challenge for governments, particularly in developing countries. Improving pedestrian infrastructure is not expensive when compared to other modes of transportation infrastructure [7].

All in all, after collecting various perception from the pedestrians and field survey, then the authors proposed five model recommendation to improve the walkway in the research locations, namely: (1) Walkway amenities improvement; (2) CPTED design application in the walkway; (3) Implementation of pelican crossing; (4) Signage and speed bump application; and (5) Ramp and S portal barrier application. The authors believed the proposed model recommendations are sufficient to enhance the walkability in the research locations. The walkability improvement in the tourism area is essentials in order to create a better experience for tourists. As a result, this research can be useful for local and central government as a reference for walkway development.

5. Acknowledgments

The authors would like to express their gratitude towards Universitas Sumatera Utara through Lembaga Penelitian Universitas Sumatera Utara for supporting this research through PENELITIAN TALENTA USU 2022 research grant.

6. Conflict of Interest

The authors declare that there is no conflict of interest regarding the research, authorship, and publication of this manuscript.

References

[1] N. Ujang and Z. Muslim, "Walkability and attachment to tourism places in the city of Kuala Lumpur, Malaysia," Athens Journal of Tourism, vol. 2, no. 1, pp. 55–68, 2015, doi: 10.30958/ajt.2-1-4.

[2] N. Ginting, "How self-efficacy enhance heritage tourism in Medan Historical Corridor, Indonesia," Procedia - Social and Behavioral Sciences, vol. 234, pp. 193–200, 2016, doi: 10.1016/j.sbspro.2016.10.234.

[3] J. Ernawati, M. S. Adhitama, Surjono, and B. S. Sudarmo, "Urban design qualities related walkability in a commercial neighbourhood," Environment-Behaviour Proceedings Journal, vol. 1, no. 4, pp. 242–250, 2016, doi: 10.21834/e-bpj.v1i4.385.

[4] S. S. Wibowo, N. Tanan, and N. Tinumbia, "Walkability measures for city area in Indonesia: Case study of Bandung," Journal of the Eastern Asia Society for Transportation Studies, vol. 11, pp. 1507–1521, 2015, doi: 10.11175/easts.11.1507.

[5] R. N. R. Ariffin and R. K. Zahari, "Perceptions of the urban walking environments," Procedia - Social and Behavioral Sciences, vol. 105, pp. 589–597, 2013, doi: 10.1016/j.sbspro.2013.11.062.

[6] J. Henderson, "Making cities more walkable for tourists: A view from Singapore's streets," International Journal of Tourism Cities, vol. 4, no. 3, pp. 285–297, 2018, doi: 10.1108/IJTC-11-2017-0059.

[7] A. M. Affif, "Walkability index of Kampung Madras commercial area," ARSITEKTURA, vol. 18, no. 2, pp. 239–248, 2020, doi: 10.20961/arst.v18i2.43421.

[8] N. Ginting, "Being manageable through self-efficacy in heritage tourism development," Asian Journal of Quality of Life, vol. 3, no. 11, pp. 29–38, 2018, doi: 10.21834/ajqol.v3i11.119.

[9] M. Southworth, "Designing the walkable city," Journal of Urban Planning and Development, vol. 131, no. 4, pp. 246–257, 2005, doi: 10.1061/(ASCE)0733-9488(2005)131:4(246).

[10] I. Blečić, T. Congiu, G. Fancello, and G. A. Trunfio, "Planning and design support tools for walkability: A guide for urban analysts," Sustainability, vol. 12, no. 11, Art. no. 4405, 2020, doi: 10.3390/su12114405.

[11] J. Leather, H. Fabian, S. Gota, and A. Mejia, "Walkability and pedestrian facilities in Asian cities: State and issues," ADB Sustainable Development Working Paper Series, no. 17, Asian Development Bank, Manila, Philippines, Feb. 2011. [Online]. Available: https://www.adb.org/sites/default/files/publication/28679/adb-wp17-walkability-pedestrian-facilities-asian-cities.pdf. Accessed: Jul. 9, 2026.

[12] J. Zakaria and N. Ujang, "Comfort of walking in the city center of Kuala Lumpur," Procedia - Social and Behavioral Sciences, vol. 170, pp. 642–652, 2015, doi: 10.1016/j.sbspro.2015.01.066.

[13] J. Speck, Walkable City Rules: 101 Steps to Making Better Places. Washington, DC, USA: Island Press, 2018, doi: 10.5822/978-1-61091-899-2.

[14] N. Tanan and L. Darmoyono, "Achieving walkable city in Indonesia: Policy and responsive design through public participation," AIP Conference Proceedings, vol. 1903, no. 1, Art. no. 080010, 2017, doi: 10.1063/1.5011598.

[15] J. Correa-Parra, J. F. Vergara-Perucich, and C. Aguirre-Nuñez, "Towards a walkable city: Principal component analysis for defining sub-centralities in the Santiago Metropolitan Area," Land, vol. 9, no. 10, Art. no. 362, 2020, doi: 10.3390/land9100362.

[16] M. Southworth and E. Ben-Joseph, Streets and the Shaping of Towns and Cities. Washington, DC, USA: Island Press, 2013, doi: 10.2307/jj.41003852.

[17] S. Gota, H. G. Fabian, A. A. Mejia, and S. S. Punte, "Walkability surveys in Asian cities," Clean Air Initiative for Asian Cities (CAI-Asia) Center, 2010. [Online]. Available: https://www.ictct.net/wp-content/uploads/23-Hague-2010/ictct_document_nr_663.pdf. Accessed: Jul. 9, 2026.

[18] M. A. G. Ferreira and S. da Penha Sanches, "Proposal of a sidewalk accessibility index," Journal of Urban and Environmental Engineering, vol. 1, no. 1, pp. 1–9, 2007, doi: 10.4090/juee.2007.v1n1.001009.

[19] A. M. Affif and N. Novrial, "CPTED assessment in high rise building underground parking facilities: Case study: Cambridge City Square," International Journal of Architecture and Urbanism, vol. 5, no. 1, pp. 11–25, 2021, doi: 10.32734/ijau.v5i1.6028.

[20] R. I. Atlas, 21st Century Security and CPTED: Designing for Critical Infrastructure Protection and Crime Prevention, 2nd ed. Boca Raton, FL, USA: CRC Press, 2013, doi: 10.1201/b15046.

[21] A. M. Affif and N. Novrial, "Implementasi Crime Prevention Through Environmental Design (CPTED) pada fasilitas parkir sepeda motor: Studi kasus: Kampus Fakultas Ilmu Budaya USU," TATALOKA, vol. 23, no. 1, pp. 127–137, 2021, doi: 10.14710/tataloka.23.1.127-137.

[22] F. Bachtiar, A. H. Rahardjo, and A. Olii, "Picking up people: Defining walkable ride-hailing transit points around MRT stations in Jakarta," in Proc. EduARCHsia & Senvar 2019 International Conference (EduARCHsia 2019), Advances in Engineering Research, vol. 192, pp. 30–37, 2020, doi: 10.2991/aer.k.200214.005.

[23] J. Uttley and S. Fotios, "The effect of ambient light condition on road traffic collisions involving pedestrians on pedestrian crossings," Accident Analysis & Prevention, vol. 108, pp. 189–200, 2017, doi: 10.1016/j.aap.2017.09.005.

[24] K. Shaaban, "Assessing sidewalk and corridor walkability in developing countries," Sustainability, vol. 11, no. 14, Art. no. 3865, 2019, doi: 10.3390/su11143865.