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Where to improve pedestrian streetscapes: Prioritizing and mapping street-level walkability interventions in Cape Town's city centre

Pedestrian interventions for healthier and more inclusive streetscapes can be powerful mechanisms to increase the safety and comfort of walking in African cities. This article proposes a multiscale walkability analysis approach to identify both suitable streets for pedestrian travel and problematic areas requiring small-scale improvements (e.g., pavement repairs, building maintenance, streetlights, and public seating). We applied a GIS-based framework to the central urban area of Cape Town, South Africa, which presents complex social and environmental challenges. For each street-and-crossing segment, a virtual pedestrian streetscape audit tool was used to collect micro- and mesoscale environmental indicators and assess the quality of public space. This composite street-level assessment tool was weighted with a space syntax analysis indicator (i.e., spatial integration) to detect the network's most interconnected and high-priority pathways. The Jenks natural breaks classification algorithm was used to classify scores for each segment, which ultimately found that the highest-priority streets for redevelopment are clustered in Bo-Kaap, a relatively disadvantaged, multicultural, and hilly district on Cape Town's west side. Policy recommendations are evaluated to increase the quality of the urban environment and the city's overall attractiveness to pedestrians. The proposed methodology facilitates more effective place management and classifies the city's needs in improvements, minimizing both time and budget costs.

Keywords: walkability, pedestrian mobility, built environment, Google Street View, Cape Town

1 Introduction

Building healthier transportation systems and more walkable and inclusive streets is vital to achieving high urban sustainability and liveability levels (Loo, 2021). *Walkability* is an umbrella term that considers the quality of the built environment as it facilitates walking (Forsyth, 2015). The concept has received substantial research interest; it has been associated, inter alia, with public health issues (e.g., physical inactivity, obesity, hypertension, and cancer; Sallis et al., 2016; Cerin et al., 2022), air pollution (Marshall et al., 2009), transport equity and car dependence (Knight et al., 2018), and real estate markets (Trichês Lucchesi et al., 2020). Thus, assessing walkability is a good way to measure the impact of urban mobility and spatial planning policies on pedestrians.

Measuring walkability is a complex task involving a variety of methods and datasets. Fonseca et al. (2022) list thirty-two attributes of the built environment that influence walkability, as well as sixty-three measures related to land use, accessibility, street network connectivity, pedestrian facilities and comfort, safety and security issues, and streetscape design. In another example, the 3D concept (Density, Diversity, Design) proposed by Cervero and Kockelman (1997) has inspired several GIS-based walkability indices of neighbourhood-level variables, such as population density, land-use mix, intersection density, and retail floor area ratio (e.g., see the GIS-based walkability app developed by Frank et al., 2010). Notably, Cerin et al. (2022) demonstrate that people living in neighbourhoods with more than 5,700 inhabitants, one hundred street intersections, and twenty-five transit stops per square kilometre are more likely to walk for transportation or physical recreation. In addition, a recent global study identified consistent associations between perceived design features and walking across twenty-one countries with different development profiles that include land-use mix diversity, land-use mix access, and street connectivity (Boakye et al., 2022). Koohsari et al. (2019) propose a non-data-intensive space syntax walkability measure based on space syntax integration (i.e., urban form) and population density (i.e., urban function). Bartzokas-Tsiompras and Bakogiannis (2022) assessed the fifteen-minute walkable city idea across 121 European metropolitan areas using comparable indicators of walking accessibility to seven destination types (i.e., schools, food shops, population, recreation, restaurants, green spaces, and hospitals) and the PROMETHEE II multicriteria approach. Some researchers distribute questionnaires, such as the Neighbourhood Environment Walkability Scale framework, to measure perceived walkability levels (Adams et al., 2009), and others apply virtual or in situ streetscape audits (Brownson et al., 2004) to capture more policy-amenable features (e.g., crosswalks, pavements, buildings, streetlights, aesthetics, and fear of crime).

However, African walkability research is still limited (Lofti & Koohsari, 2011; Ramakreshnan et al., 2021) and comprises only 1.5% of the global walkability literature (Hasan et al., 2021), even though African people are more active for transport (56 min. a day) than the global average (43.9 min. a day) (UN-Habitat, 2022: 13). Previous African walkability studies have found that, compared to North American or European urban settings, different environmental attributes influence walking in Africa. For example, the perception of traffic safety in African environments is incidental to utilitarian walking because local populations tend to be more familiar with handling dangerous and congested roads; rather, it is the perception of crime that deters people from walking (Oyeyemi et al., 2017). Furthermore, Oyeyemi et al. (2017) indicate that local identifiers and aesthetics do not encourage pedestrian trips because African populations generally have low expectations about the attractiveness of public spaces. Another study in Accra, Ghana, found a positive association between perceived walkability and prosocial behaviour (e.g., pro-environmental behaviour and socially responsible consumption), which is strengthened by urban residents' sustainability knowledge (Opuni et al., 2022).

Globally, prioritizing interventions in the pedestrian environment continues to draw research attention because even minor improvements to the street network can reduce pedestrian travel time and increase sustainable urban mobility (Delso et al., 2017, 2018). The targeted focus of investments in pedestrian mobility infrastructure ensures that resources are used efficiently (D'Orso & Migliore, 2020). Introducing GIS tools in walkability studies has proven to be successful in formulating geographically significant methodologies to characterize road networks (Delso et al., 2017, 2018; Ortega et al., 2021). In this regard, street-level pedestrian suitability analysis can be applied to the urban environment. This analysis combines street network proximity and connectivity with several variables concerning pedestrians' physical environment, and it can generate priority methodologies that easily identify which street segments require improvements (Delso et al., 2019). Priority methodologies provide information about city sectors that require alterations to the built environment to boost urban mobility (Ortega et al., 2021), such as street furniture or pedestrian infrastructure (Delso et al., 2017). Similarly, bicycle suitability analysis relies on common open-source datasets of factors that influence route choices, such as speed limit, slope, and type of cycle lane (Wysling & Purves, 2022). However, these methods can fail to consider audit-based data assessing the microscale elements of pedestrian and public space infrastructure, and they may be insufficient to generate feasible, targeted actions for healthier streets.

Therefore, this study proposes a mixed-methods geographical approach to prioritizing and mapping street-level walkability

Figure 1: Case study area (illustration: Alexandros Bartzokas-Tsiompras).

interventions to improve pedestrian mobility and urban design. This approach combines some of the most important elements of the city's built environment, including microscale environmental factors, which are relatively easy to change, and street-level connectivity, which is harder. The outcome of this approach is Street Segment Suitability (SSS), which indicates the degree to which pedestrians can use a street (i.e., how suitable it is for comfortable walking). The SSS score of every street segment is then subtracted from the space syntax integration to produce a Street-level Redevelopment Priorities (SRP) index. The higher the SRP value, the more work is required for maintenance, renovation, or improvement. Because many African cities lack the transportation research depth that their Global North counterparts enjoy, Cape Town's city centre was selected as a case study.

2 Case study area: Cape Town

Cape Town is the legislative capital and second-largest city in South Africa, with an estimated population of 4.68 million as of 2021 (City of Cape Town, 2022). In recent decades, the city has seen substantial urban growth due to rural–urban migration. Reflecting its apartheid legacy, it retains significant socio-spatial inequalities that reinforce socio-spatial segregation, poverty, and exclusion (Lloyd et al., 2021). From 1980 to 2000, Cape Town's population doubled (Western, 2002) and then increased steadily at a rate of 3.3% per annum between 2000 and 2010 before slowing to 1.5% per annum from 2010 to the present (Scheba et al., 2021). However, between 1998 and 2019, the urban land cover grew from only 625 km^2 to 679 km^2, meaning population growth outstripped it by 8.7% (Scheba et al., 2021). This underscores the densification and compaction trend reported by many scholars (Horn, 2018; Scheba et al., 2021). Furthermore, Cape Town is one of the most congested cities in Africa, mainly because of the poor quality of mobility. Its inefficient and unsafe public transportation network, with a network density of about 2 km/km^2 (UN-Habitat, 2013), is far outpaced by car travel. Indeed, 60% of residents travel by car, and only 4% walk (Deloitte, 2019). In addition, despite a large network of bike lanes (about 450 km), the share of cycling is less than 1%. Meanwhile, with about 7 km of pedestrianized streets, Cape Town has the fourth-largest network (but small in global terms) of pedestrianized streets in all of Africa (Bartzokas-Tsiompras, 2021).

Cape Town's urban fabric ranges from colonial grid patterns to conventional sprawling neighbourhoods (Wilkinson, 2000),

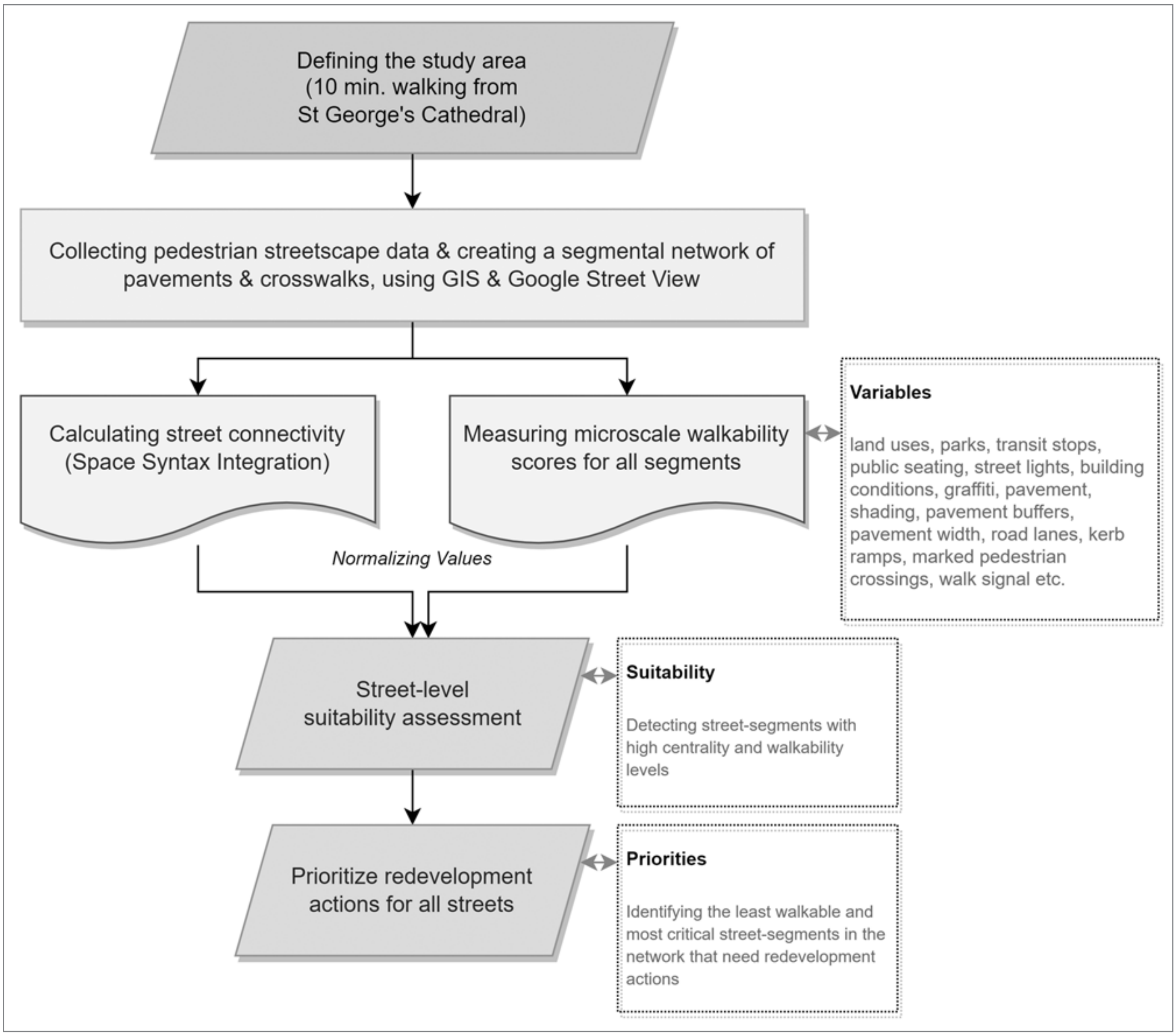

Figure 2: Proposed methodology (illustration: authors).

and half of the total energy consumption at the city level is transportation-based (in many European cities the levels are roughly one-quarter; UN-Habitat, 2013). This complex urban system arose from former social and spatial policies (Ordor & Michell, 2022), notably the spatial inequalities that divided the city under the previous century's apartheid system (Odendaal & McCann, 2016). Apartheid forced the city's African and coloured populations to live in racially segregated residential zones with underdeveloped housing, transportation, and public services (Gibb, 2007). To this end, apartheid transportation policies were designed to decrease connectivity and deter active travel in turn. Bo-Kaap, one of the oldest districts of Cape Town, located west of the city centre, is typical of the city's formerly segregated neighbourhoods. Notably, it is the centre of Cape Malay Muslim culture. This area is now facing gentrification, as residential upgrades increase property values and displace the neighbourhood's original inhabitants (Kotze, 2013).

Therefore, St George's Cathedral was selected as the focal point of this research due to its prominent position in Cape Town's urban core and central business district (Gibb, 2007). As shown in Figure 1, a ten-minute walking distance isochrone from St George's Cathedral circumscribes the study area, taking into account the real street network and not a straight line (Boisjoly et al., 2018).

3 Materials and methods

The proposed method aims to support planners and decision-makers in prioritizing investments for more pedestrian-friendly streets by examining the restrictions that urban planning imposes on pedestrians (Wood, 2022). This method combines multiple aspects of the built environment, represented by space syntax measures and microscale walkability attributes. Data collection is based on pedestrian streetscape observations, collected virtually via the Google Street View service. The new street-level indicators for the central Cape Town area and the assessment method formulate an alternative way to quantify and map problematic public spaces in urgent need of feasible, cost-effective solutions. The process is briefly depicted in Figure 2.

3.1 Street connectivity (syntactic measure of integration)

According to Su et al. (2019), connectivity could be described as the extent to which routes inside a network are interconnected and the degree of various directional connections from origins to destinations. This study expresses connectivity through space syntax theory, which uses topological approaches to analyse how pedestrians move through public space (Hillier et al., 1993). A variety of parameters can express space syntax analysis, but the most important is arguably the syntactic measure of integration, as suggested by several studies (Hillier et al., 1987, 1993). Space syntax integration is a topological measure of centrality that interprets the mean number of changes of direction needed to move from one place to all other places. Therefore, it produces a more complete sense of space depth, rather than metric distance. In other words, per Koohsari et al. (2019), space syntax integration expresses the accessibility of street segments to all other street segments in a given area (i.e., "to" movement) and estimates how many people are likely to be in a given space. High space syntax integration values indicate a well-connected segment, and low space syntax integration values an isolated one (Hillier & Hanson, 1984). Because the case study area includes several neighbourhoods, a local scale was applied to calculate the space syntax integration values within a 250 m radius, thereby relating the characteristics of neighbourhood structure to pedestrian mobility. The QGIS Space Syntax Toolkit (https://plugins.qgis.org/plugins/esstoolkit/) was used to calculate space syntax integration values. This is a QGIS plug-in for spatial network and statistical analysis; it provides a front-end for the essential depthmapX software within QGIS and offers user-friendly space syntax analysis workflows in a GIS environment.

3.2 Street-level walkability framework

A brief modified version of the original Microscale Audit of Pedestrian Streetscapes (MAPS-Mini) tool was selected to perform the prolific task of street auditing (Sallis et al., 2015). The original tool contains fifteen items (mostly binary or frequency questions) that measure crosswalk features, active uses, access to parks or plazas, transit facilities, public seats, streetlight intensity, building condition, graffiti, the presence of pavements, pavement conditions, pavement buffers, bike lanes, and shade (Geremia & Cain, 2015). Physical activity studies in US cities have validated the composite scores of the original MAPS-Mini tool, finding a positive and statistically significant correlation with increased active travel outcomes for all ages (Sallis et al., 2015). In addition, researchers from Europe have used MAPS-Mini to map and quantify street-level walkability attractiveness and inequities in urban design (Bartzokas-Tsiompras et al., 2020, 2021; Bartzokas-Tsiompras & Photis, 2021).

This study adds four extra variables to the original tool to produce new layers of microscale information, which are relevant either to Cape Town's local context or to potential street-level redevelopment schemes. The first added variable concerns pavement accessibility (S9_1) and asks whether the pavement is continuous. The second relates to pavement width (S13). Both pavement continuity and pavement width provide insight into walking comfort levels. The third added variable describes road characteristics and assesses the number of traffic lanes (S14), which is a crucial parameter in road diet and placemaking programmes. Finally, the fourth relates to street vibrancy by capturing the intensity of shopping streets (S15) and assessing whether a given street segment is purely commercial.

Regarding the street observation method, we apply a hybrid method employing GIS and Google Street View (Lee & Talen, 2014) in a fifteen-day auditing process. Every street segment is audited virtually using imagery data from either 2015 or 2017 (based on availability), and the result is recorded with a single observer in the GIS database (i.e., ArcGIS 10.3). For each street segment, each of the nineteen variables receives either 0 points or 1 point; some variables can receive up to 2 points. Of the nineteen variables, sixteen evaluate the street segment itself, and the rest evaluate the street crossing (see Figure 3). There are 1,025 audited street segments with a total length of approximately 78.6 km. Table 1[1] briefly summarizes the variables and their scores.

The Total Walkability Score (TWS) of each street segment and crossing is equal to the sum of the individual scores of the evaluation of each variable divided by the maximum possible sum (26 points) that an evaluated segment can obtain. The equation is as follows:

$$\mathrm{TWS} = \frac{\sum_{i=0}^{19} x_i}{26} \quad (1)$$

where TWS is the Total Walkability Score, and x_i is the segment's variable.

TWS varies from 0 to 1, with 0 indicating the lowest possible walkability and 1 the highest.

Figure 3: Example of street segment and crossing (source: Google Street View; illustration: authors).

3.3 Street segment suitability (SSS)

Having obtained street-level connectivity measures (i.e., space syntax integration) and walkability scores, the next step in the methodology is to multiply them, after converting the dimensionless values to a 0–1 scale via min-max normalization. The resulting value, SSS, depends on the initial space syntax integration and walkability values being at most equal to or less than the normalized space syntax integration value. The combination of these factors represents the actual state of the pedestrian infrastructure (Delso et al., 2019). The equation is as follows:

$$SSS_i = x_i \cdot y_i \qquad (2)$$

where SSS_i is street segment suitability, x_i is the normalized space syntax integration value, and y_i is the normalized value of walkability (TWS).

3.4 Street-level redevelopment priority (SRP)

The final step of the proposed method is to extract and map street-level redevelopment priority (SRP). SRP is obtained by subtracting the suitability (SSS) score of each segment from the space syntax integration value, which represents street-level centralities. The result is the difference between the actual and ideal pedestrian environment, indicating the need for street interventions to improve pedestrian mobility. The higher the SRP value, the further the street environment is from ideal conditions (as represented by the normalized space syntax integration value). The final step is severing the street segments of highest priority (i.e., the first quantile) and recategorizing them into three classes. The Jenks natural breaks classification algorithm is used because it provides greater emphasis on low-frequency data. The outcome is the identification of the highest-SRP areas requiring immediate pedestrian interventions. These top SRPs are denoted as street segment immediate priorities (SSIP). The equation is as follows:

$$SRP_i = x_i - SSS_i \qquad (3)$$

where SRP_i is the street-level redevelopment priority, x_i is the normalized space syntax integration value, and SSS_i is the street segment suitability.

4 Results

The aggregated results of the collected data for each of the microscale variables are presented in Table 2.[2] Public transit stops (S3 = 6.5%) and public seating (S4 = 14.2%) are limited in most parts of the city. The widespread presence of streetlights (S5 = 96.7%) and pavements (S9 = 93.5%) across the city centre, satisfactory building maintenance (S6 = 81.6%), sufficient pavement width (S13 = 74.8%), absence of graffiti vandalism (S7 = 92.3%), and the presence of mostly single traffic lane roads (S14 = 39%) are considered positive elements of

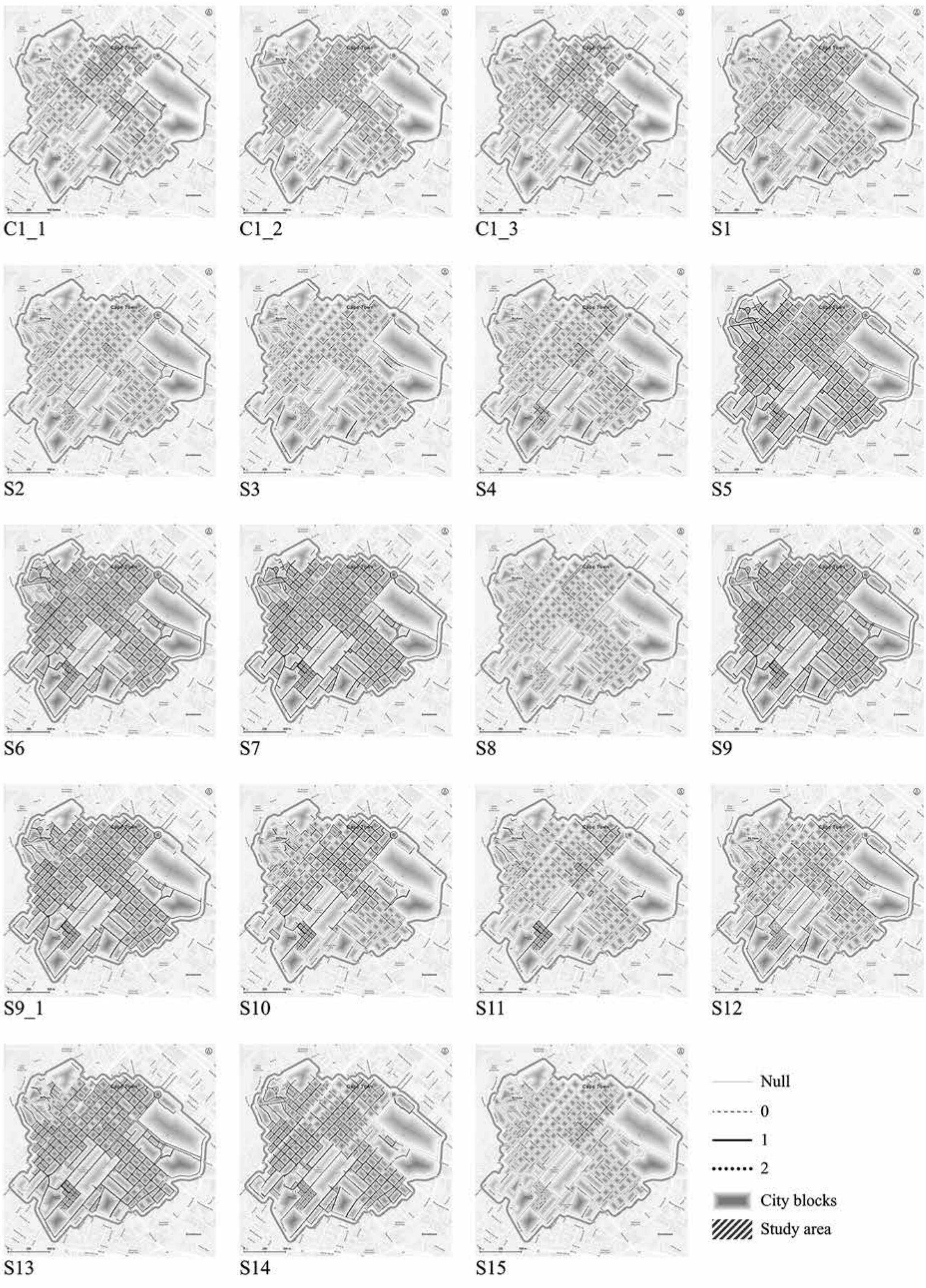

Figure 4: Maps of audited street segments and crossings for each variable (illustration: authors).

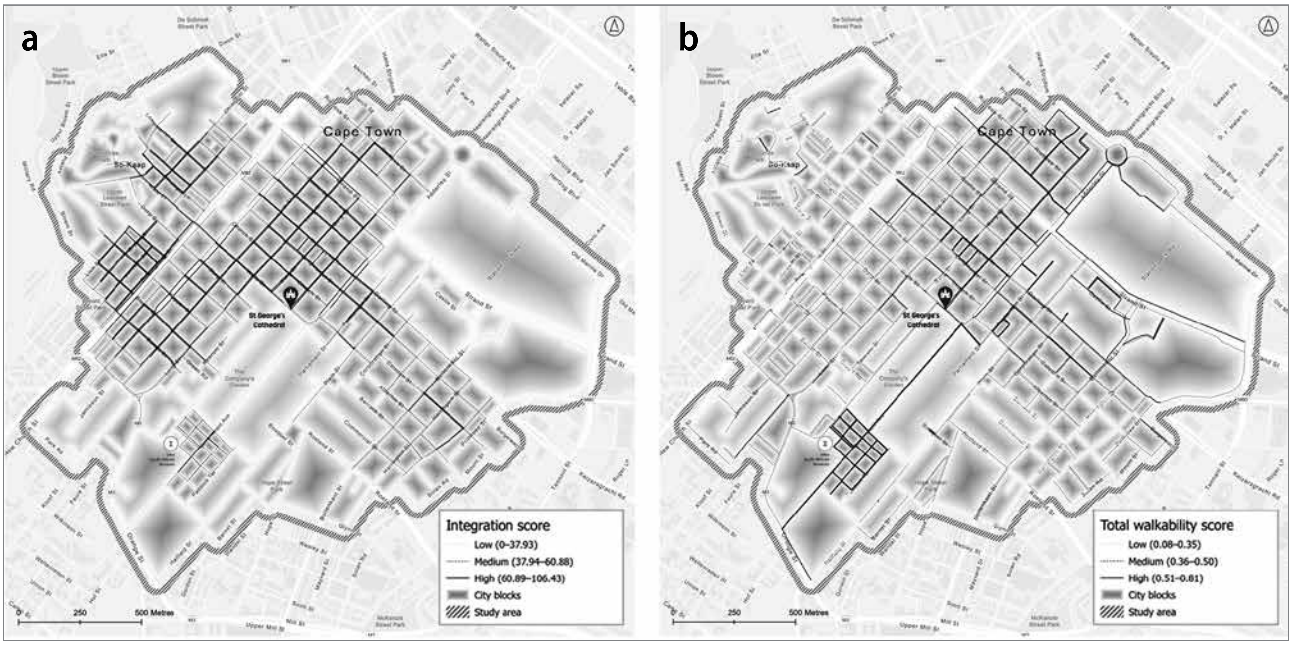

Figure 5: a) Space syntax integration (connectivity) map; b) TWS map (illustration: authors).

walkability. As far as street crossings are concerned, pedestrian walk signals (32.2% of crossings have a pedestrian walk signal), kerb ramps (52.9% of crossings have pre- and post-kerb ramps), and marked crosswalks (39.3% of crossings have a marked pedestrian crossing) are not widespread enough across the city, leaving room for further improvements.

As illustrated in Figure 4, most of the active uses (S1) are located in the central business district northeast of St George's Cathedral. Parks (S2) and public seating (S4) are chiefly concentrated northeast and southwest of the city centre. Transit stops (S3) are sited mainly to the east, across the large avenues (e.g., Strand St.). Poorly lit streets (S5), buildings with graffiti (S7), and streets with no pavements (S9) are concentrated in the western and northwestern area of the Bo-Kaap district. The same pattern follows the variables of building condition (S6) and pavement continuity (S9_1), with dilapidated buildings and non-continuous pavements clustered to the west (i.e., the Bo-Kaap district). Bike lanes (S8) are less prevalent in the area, except in the central business district area northeast of St George's Cathedral. High-quality pavements (S10) and pavement buffers (S11) tend to be located around the focal point, whereas problematic pavement sections are found in the eastern and western districts. Shadier pavements (S12) and streets with fewer than two road lanes (S14) are dispersed across the study area. However, pavements of insufficient width (S13) (< 2 m) are observed mainly in the western area of the Bo-Kaap district. Purely commercial pedestrian streets (S15) are sparse in the city centre; they can only be found northeast of St George's Cathedral; namely, St. George's Mall Street. Regarding crosswalk facilities, we observe many in the northern

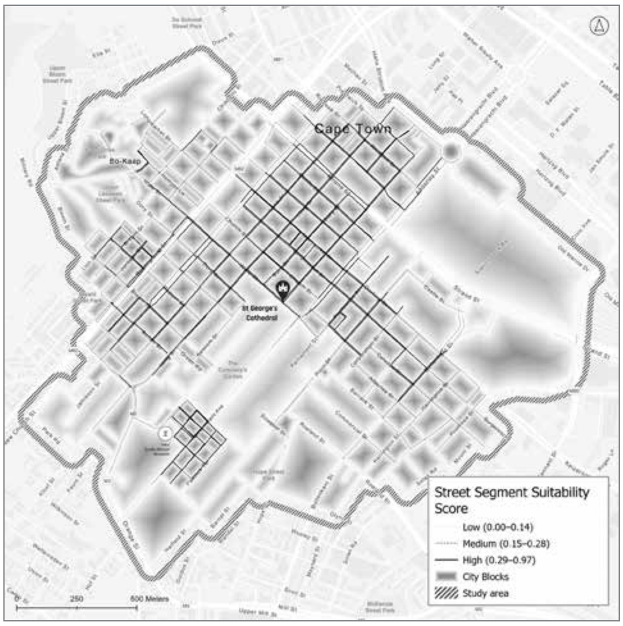

Figure 6: SSS map (illustration: authors).

and eastern parts of the study area. However, it is clear that most of the least safe and comfortable crossings are sited to the west and southeast, in the Bo-Kaap and Zonnebloem districts, respectively.

Figure 5 illustrates the space syntax integration and TWS values. Integration values are directly related to the geometry of the street network, with higher values generated at three discrete clusters north, west, and northwest of St George's Cathedral. Meanwhile, the highest TWS values are concentrated along an axis running through the cathedral focal point in a northeast–southwest direction. Most of TWS's lowest values

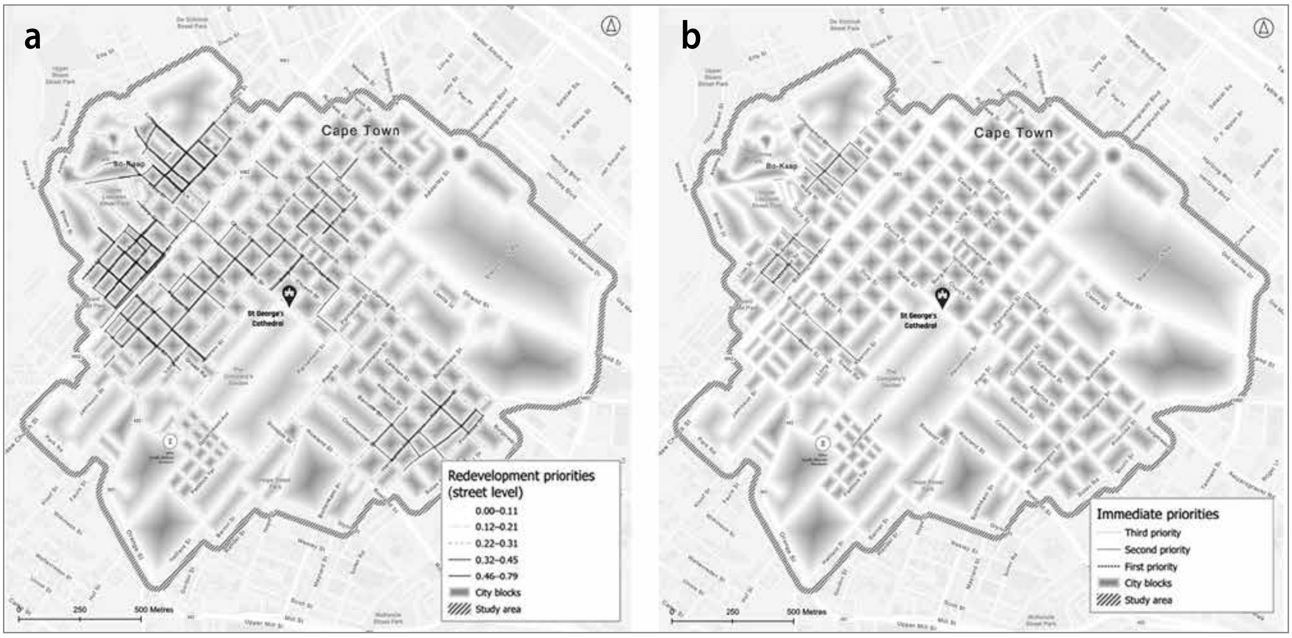

Figure 7: a) SRP map; b) SSIP map (illustration: authors).

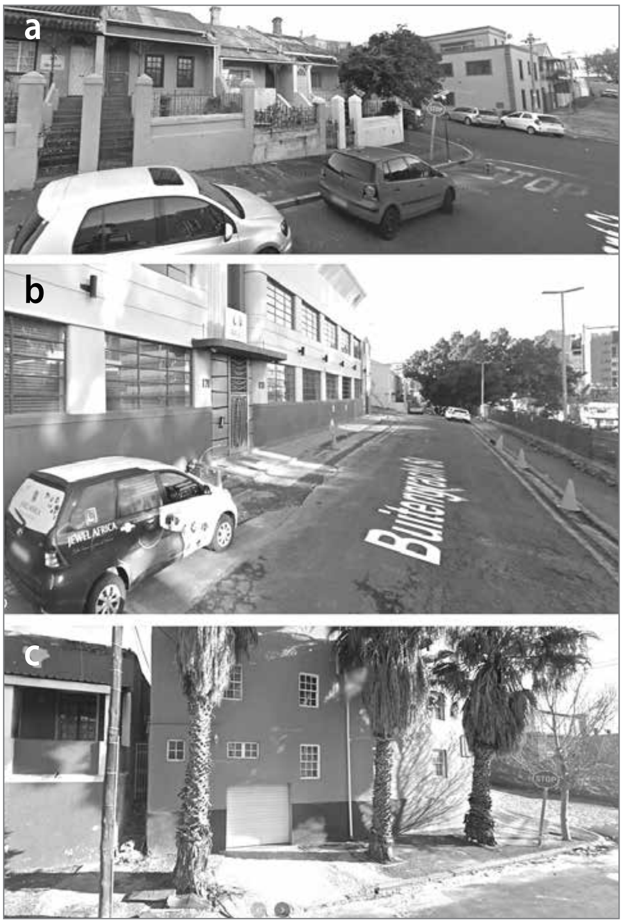

Figure 8: a) Bryant St, a first-priority street; b) Buitengracht St, a second-priority street; c) Jordaan St, a third-priority street (source: Google Street View).

are focused on the northwestern edge of Cape Town's city centre (the Bo-Kaap district), at the location where connectivity shows the highest values.

The SSS map (Figure 6) indicates that the most suitable segments for pedestrians are mostly those northeast and southwest of the focal point, where the highest values of walkability are concentrated. Other high SSS values are observed in several areas in the western part of the city centre area. A large cluster of high SSS values is located around Greenmarket Square, a vivid hub of Cape Town only three blocks northeast of St George's Cathedral. Another smaller cluster of high SSS values is located southwest of the focal point, in a park area between the Iziko South African Museum and the South African National Gallery and South African Jewish Museum.

After subtracting the SSS scores from each corresponding segment's normalized space syntax integration value, the SRP index was derived. Cape Town's areas with the highest SRP values are located on the city's western side; these are the segments that need immediate attention in urban renovation projects. Two discrete pockets of high SRP values (i.e., where the SSS values are moderate to low and the corresponding space syntax integration values are extremely high) are concentrated in the Bo-Kaap district. A similar, but less severe, pattern is also found in a small pocket of the southeast with high SRP values (Figure 7). Ultimately, the segments with the highest SRP values coincide with the most degraded regions of the study area.

Next, to calculate the SSIP, the SRP quantile with the highest priority (i.e., the first quantile) is reclassified into three classes by way of the natural breaks classification algorithm. The first class indicates first-priority streets; these are the most critical segments in the network with the greatest potential for pedestrian infrastructure improvements. As expected, the SSIP is concentrated in the west of the city centre and in the Bo-Kaap neighbourhood.

To better understand street conditions, Figure 8 shows three example segments: one for every SSIP category. Each street segment has a high space syntax integration value but low pedestrian suitability due to a relatively low TWS.

Case a (Bryant St) belongs to the first-priority category. Here, most of the streetscape-level variables are absent. Well-engineered pedestrian crossings are missing, with buildings and pavement in poor condition. Pavement shading and buffers are non-existent, as are transit stops, active façades, bike lanes, parks, and public seating. These factors combine to produce a low TWS score. A similar pattern is found in Case b (Buitengracht St), except that this segment exhibits good building maintenance and ample lighting, resulting in a slightly higher TWS score. Consequently, Case b is classified as a second-priority segment. Finally, Case c (Jordaan St) has a slightly lower space syntax integration value than Cases a and b, but its low TWS value creates a gap between integration and suitability wide enough to classify this segment as third-priority as far as renovation projects are considered.

This case study identifies street segments of low pedestrian quality. After classification by priority categories, planning authorities can implement urban renovation projects to enhance the quality of the streets in a logical order. Attention to some inadequate microscale variables can potentially increase TWS and SSS values, consequently decreasing SRP, without consuming excessive amounts of time or resources. For example, public seating, streetlights, and pavement buffers constitute small-scale interventions that are neither time- nor resource-intensive. Streetscape audits provide detailed information about inadequate or missing walkability variables, allowing for targeted alterations to the built environment to enhance the pedestrian experience. Improving the microscale features that directly affect pedestrians, such as pavements, crossings, and street equipment, has a significant positive impact on leisure walking and physical activity (Steinmetz-Wood et al., 2020). Thus, focusing on the street segments of highest priority can greatly improve Cape Town's pedestrian mobility.

5 Conclusion

The methodology proposed in this study offers a novel way to prioritize and map street-level walkability interventions. This approach generates new insights regarding microscale walkability issues in the Cape Town city centre by integrating nineteen spatial indicators for the pedestrian environment. For cities and countries where street-level data are either non-existent or sporadically collected, strengthening public space findings is vital for addressing complex sustainability issues and designing data-driven policies for healthier and more inclusive transportation systems and communities. For every street segment of the study area, the space syntax integration measure was computed (the initial intent was to use OpenStreetMap data, but the originally produced network of pavements and crosswalks was much more comprehensive and topologically at the scale of interest). This helped map urban centralities in the study area and identify the most critical streets requiring immediate pedestrian interventions. Under this framework, planners and policymakers can better distribute limited investment resources to optimize improvements in pedestrian mobility. Similar geospatial concepts have profound applicability in local strategic plans and are ideal for old neighbourhoods that cannot alter their urban structure or struggle to preserve their local identity, while simultaneously attracting significant pedestrian activity. For example, this framework could be applied to walled towns like the Spanish city of Lugo or Manila's Intramuros district, or to historical districts like the Plaka in Athens.

The findings of this research demonstrate that streets with the greatest need for immediate action are predominantly concentrated in the western parts of the city centre of Cape Town and particularly in the Bo-Kaap district, which lacks the necessary infrastructure to support safe and comfortable pedestrian trips. Improving pedestrian facilities and comfort in the streets of this neighbourhood could increase pedestrian traffic and satisfaction, as well as overall quality of life. However, any potential redevelopment programme should consider the existing social pressures of the district, especially the impacts of racial segregation and gentrification processes (Kotze, 2013). Furthermore, redevelopment schemes should preserve special architectural features, such as colourful houses, mosques, and cobbled streets. When pedestrian interventions align with the socioeconomic features of the region, the assimilation process for the local population is easier (Forouhar & Forouhar, 2020). Such efforts help improve the urban environment and preserve local identity, which in this case is the Cape Malay Muslim culture (Kotze, 2013). Therefore, the proposed street-level priorities could combat the inner-city inequalities of Cape Town's central area, creating more opportunities for the local people, and leading to a more sustainable urban development.

Of course, the findings of this study have some limitations. First, because the microscale audit was made using online Google Street View imagery data, the outcomes were determined by the period of image capture, which in some cases differed. In rare instances, some segments lacked images altogether, thus limiting the reliability of the auditing process.

Second, regarding space syntax integration, the scores on the edges of the designated study area suffer from the edge effect because street segments and crosswalks outside the designated area were not considered. Finally, a significant limitation of this work is that walkability scores have not been correlated with local pedestrian counts or physical activity data. Future research could address these limitations by considering more environmental and social variables (e.g, cleanliness and security) in walkability modelling or by analysing a larger, more heterogeneous study area. In addition, disseminating a survey about walking perceptions could help quantify the importance of urban design features in local mobility patterns, as well as the health and environmental benefits of a more pedestrian-friendly Cape Town.

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Notes

[1] Available at https://figshare.com/s/838b7c93fb6f187b0880.

[2] Available at https://figshare.com/s/37780a5dbdc821dda717.

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