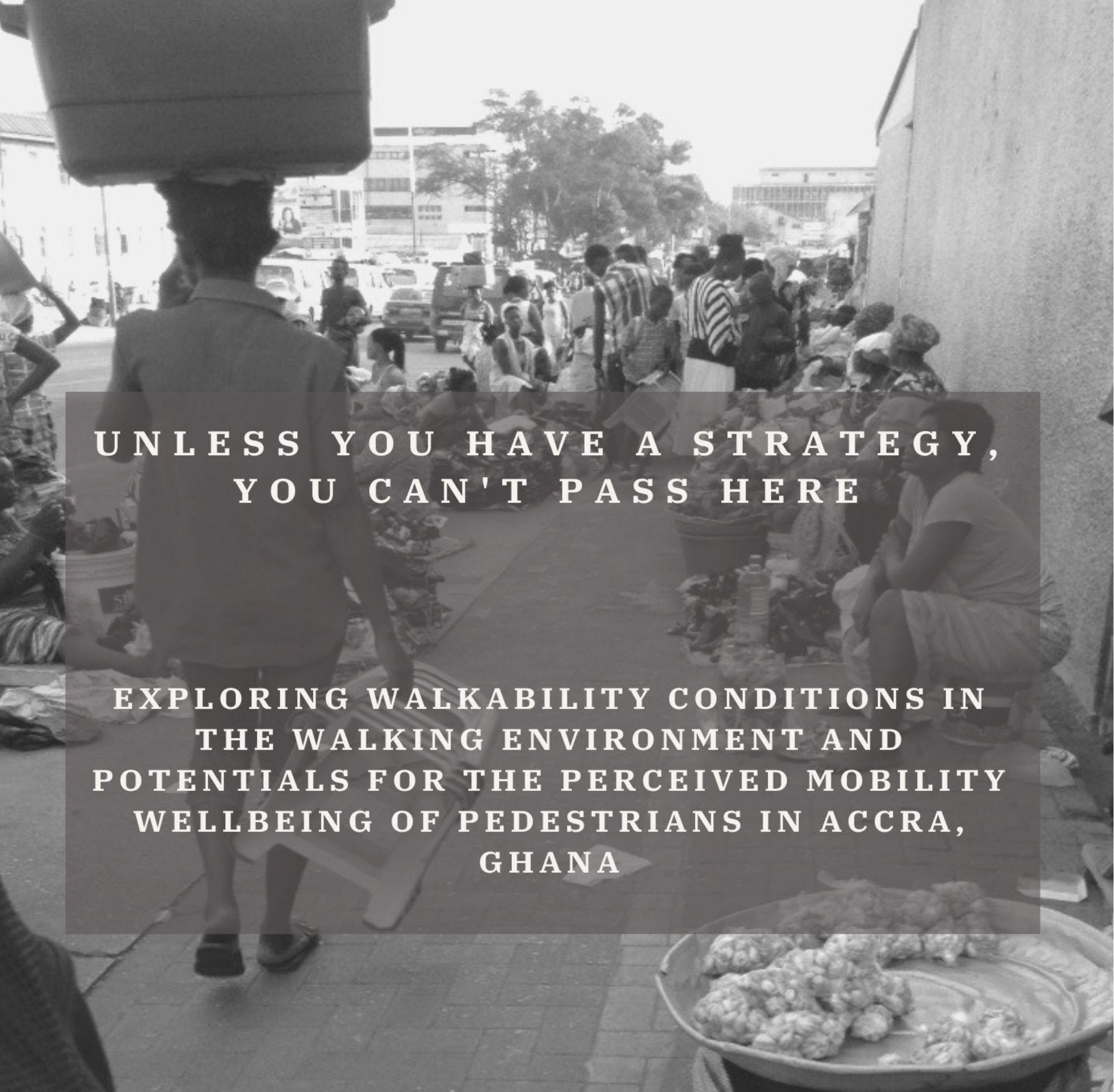

UNLESS YOU HAVE A STRATEGY, YOU CAN'T PASS HERE

EXPLORING WALKABILITY CONDITIONS IN THE WALKING ENVIRONMENT AND POTENTIALS FOR THE PERCEIVED MOBILITY WELLBEING OF PEDESTRIANS IN ACCRA, GHANA

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Title

Unless You Have a Strategy, You Can’t Pass Here: Exploring Walkability Conditions in the Walking Environment and Potentials for the Perceived Mobility Wellbeing of Pedestrians in Accra, Ghana

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List of Abbreviations

Ab	Area of Buffer
Ah	Area of Hexagon
AMA	Accra Metropolitan Assembly
CBD	Central Business District
CWI	Composite Walkability Index
DUR	Department of Urban Roads
GHA	Ghana Highway Authority
LUSPA	Land Use and Spatial Planning Authority
MLGGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal, District Assemblies
NMT	Non-Motorised Transport
NRSC	National Road Safety Commission
NTP	National Transport Policy
SDGs	Sustainable Development Goals
SRQ	Sub Research Question
TCv	Total Composite Value
UMI	Urban Mobility Indicators

ABSTRACT

The nature of an urban environment is crucial in experiencing mobility. How people feel when they walk and their experiences throughout their journey speak about their wellbeing. It is important that pedestrians do not walk for the sake of it but also acquire the inherent benefits that come with it. With the backdrop of scholarly discussions addressing the recent call for sustainable mobility, walkability has been a concern for many cities and regions. However, a key concern is that the study of walkability is focused on walking behaviour, spatial attributes, or the experience, though not jointly. It is essential to understand the reality of walking environments, their adverse influence on defining walkability, and the role these environments play on the overall experiences of pedestrians altogether. Understanding that walkability is more than the quality of the walking environment is essential in realising a walkable city. What is walkable is informed by the performance of the conditions available in the walking environment and the experiences of pedestrians. Advocating for more walkable cities but catering to merely the activity (walking) and the infrastructure is only one part of illuminating sustainable mobility in emerging cities such as Accra, Ghana. For this reason, this research explores the walkability conditions in the walking environment and the potential for improving the perceived mobility wellbeing of pedestrians in the Accra Central Business District (CBD). It employed interviews with pedestrians and experts, observations, media analysis, and composite spatial analysis with spatial data to understand the walkability conditions (spatial and nonspatial) and the influence on perceived mobility wellbeing through perceptions of pedestrians. The outcome suggests that the Accra CBD has fewer walkable roads than usual to support the perceived mobility wellbeing of pedestrians. The perceived mobility wellbeing of pedestrians thus is a combination of experiences, expectations, realisation, and satisfaction expressed through the safety, comfort, and convenience of the walking environment. Based on this contribution, refinements could be made to Forsyth's (2015) framework on walkability to consider mobility wellbeing as the fourth element for outcomes of walkability. Hence, it is imperative for policymakers and planners to push for a walkable city initiative, catapulted by a thorough evaluation of the walking environments and user satisfaction building on this premise to make cities walkable and liveable for all.

Keywords: Walkability conditions, spatial and nonspatial, composite walkability index, perceived mobility wellbeing, GIS, Accra CBD

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Before you is the toil of my two-year MSc degree in Landscape Architecture and Planning at Wageningen University. This thesis report is a result of my relentless effort to try new things such as composite analysis with GIS and exploring formulas for calculating the walkability index. This provided for me an in-depth understanding the impact on mobility wellbeing as a novel concept.

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Dear mom, thank you!

ML Amegah

CHAPTER 1

INTRODUCTION

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1.0 INTRODUCTION

1.1 Walking for the sake of it?

In a compact city, the quality of transportation is critical to the city's social and economic development. Motorised transport dominates major cities worldwide, particularly in developing countries where this mode of transportation directs the movement of goods and services(van Wee et al., 2013). In contrast, non-motorised transport (NMT), primarily walking, has been the most common mode of transportation for people living in developing cities especially around the Central Business District (CBD), as noted by Amoako et al. (2014). Walking has been identified as a reliable mode of transport, hence one of the most sustainable mobility systems either as a transportation mode or for recreational purposes. With recent advocates for more sustainable cities, walking has been one of the avenues to achieve that goal.

According to Kelly et al. (2011), walking serves as a means of experiencing and interacting with the local environment and broader society than other forms of transport, particularly motorised vehicles. Implicitly, it means that walking and the walking environment impact the liveability of a place. Thus, when this space is not up to par, it also affects the pedestrian experiences of the walking environment, eventually affecting their perception and motivation to walk as a mode of transport.

Notably, it offers substantial benefits when the physical and social conditions of the urbanised area are favourable and prioritised in planning. These benefits make walking desirable not just as a mode of transport. In major cities like Vienna, where walking is prioritised, there are conditions in the form of infrastructure and policies to facilitate and make walking safe, comfortable, and convenient for pedestrians and non-pedestrians (Kaufmann & Ausserer, 2008).

Over the last few years, there has been growing attention to walkable cities in research and practice. This has called for several transport planners to advocate for the prioritisation of walkability in emerging cities in developing countries. Studies on walking and walkability have contributed to the inception, readjustment and improvement of walking infrastructure and policies globally to reduce carbonised transport systems, improve health and decongest traffic (Shaheen et al., 2021). These benefits call to the attention that walking for the pedestrian must not be just for its sake but also to get the implicit benefits. Addressing the overarching aim of the Sustainable Development Goals, especially goal 11, which aims to create sustainable communities and cities, is crucial in transport and mobility planning. Specifically, Target 11.2, Indicator 11.2.1 calls for access to safe, affordable, accessible and sustainable transport systems for all, intending to improve road safety (UNGA, 2015). There is, therefore, the need to promote more walkable cities (Visvizi, Abdel-Razek, et al., 2021). This is not just directed at improving the behaviour or activity but people's experiences.

1.2 The walkable conditions

Walking is an equitable mode of transport available for the more significant portion of the population regardless of their social and economic status. However, the conditions that make walking favourable is often problematic for pedestrians, especially for a marginalised group like women, children, and persons with disabilities in several parts of the world (Amoako et al., 2014; Amoako-Sakyi, 2013; Hidayati et al., 2020; Porter, 2002). The quality of these walking conditions contributes to the walkability of the environment. The walkability of a place is defined by Lo (2009) as the inherent conditions of the walking environment considering elements that constitute the street design and land uses available to support the multimodal connections to improve the unobstructed pedestrian journey in pedestrian space as well as the perceptions of the pedestrians and how they experience the environment.

Similarly, Southworth (2005) establishes that a place is walkable when it can support walking activities by providing for the safety and comfort of the pedestrian. For this reason, the quality of the walking environment depends on the quality of conditions provided by the environment to support walking for purposes including transport and access-driven purposes.

All things being equal, walking should provide a myriad of environmental, health (UNGA, 2015) and social benefits that improve the liveability and sustainability of cities. To this end, studies have been conducted in European, American, and South Asian contexts to advocate for walkability in cities (Ewing & Handy, 2009; Forsyth & Southworth, 2008; Litman, 2003; Lo, 2009; van der Bijl, 2020). As established by Forsyth (2015), the perceived outcomes for promoting walkability include liveability, social equity, environmental preservation, and other recreational activities. This, however, indicates that the implicit aim of walkability is to provide maximum satisfaction for pedestrians to decide to walk, thus contributing to the mobility wellbeing of the pedestrian. It includes how pedestrians perceive their walking environment and experience the conditions to encourage walking. In this light, walkability is the basis for a sustainable city (Forsyth & Southworth, 2008)

Generally, the walkability of a city is defined by the social, physical, infrastructural, and environmental conditions as well as the perceptions of the individual pedestrian. These factors include but are not limited to the physical infrastructure available and accessible, the distance to cover, and the safety of using such walking routes. According to Forsyth (2015), the presence or absence of these conditions defines the walkability of a place as a means, outcome, or proxy for improving placemaking. For instance, the traversability of the environment, which measures the present barriers, also threatens the pedestrian environment (Forsyth, 2015). It reduces the functionality of the walking environment and jeopardises the city's walkability for pedestrians (Lo, 2009).

Moreover, the walkability concept has been investigated in various disciplines. These disciplines respond differently to answering what should be considered walkable. For instance, Lo (2009) has an overview of the interests for walkability in urban design, transport planning, civic engagement, and public health contexts, which is apparent in the definition of walkability developed over time. Although these disciplines come up with insights specific to the disciplinary view, it is imperative to have a broader view of the concept. This gives an interdisciplinary approach to comprehensively address the overview of walkability conditions and how they manifest and can be managed. Nevertheless, Lo (2009) establishes that some indicators coincide in all these disciplinary research needs to be appreciated.

Walkability indicators developed over time to measure walkability, aside discipline, are specific to places with different cultures and people. For example, in the Western context, where walking is encouraged to gain from the implicit benefits of walking, these walking conditions are investigated to improve the place's walkability. Thus, it is also imperative to consider these walkability conditions in developing countries, notably sub-Saharan African countries like Ghana, where walking is already an asset but limited by several inconveniences.

1.3 The Ghanaian context of walking

Walking in Ghana is generally done by low to - middle-income people who have no access to private cars or are limited by public transport. It is a means of avoiding traffic, yet the decision to walk becomes a nuisance as several factors make walking undesirable for pedestrians. It plays a huge part in city and street life, liveability, and sense of place, quickly becoming a part of the Ghanaian way of life. A significant percentage of dwellers use their vehicles and public transportation (Amoako et al., 2014), which is the case for most developing cities in the Sub-Saharan region. Due to heavy traffic congestion, most city dwellers take faster trips to the CBD on foot rather than spend hours in traffic (World Bank Group, 2019). However, it is worth noting that the activity is not the problem; the conditions available to support walking concern emerging research.

Most of the research on walkability and pedestrian activities in Ghana usually calls for pedestrian safety and marginalised groups, slowly drifting the attention from the conditions that make the walking environment conducive enough to be safe (Amoako-Sakyi, 2013; Amoako et al., 2014). A less thorough investigation has been done on the conditions that make a city walkable enough to improve the mobility wellbeing of adult pedestrians. Aside the physical conditions, traffic safety is one condition that renders the walking environment unfavourable for walking. Due to the system of road sharing, without adequate traffic calming measures, it compromises the traffic safety of the pedestrian as they are the most vulnerable road users (Amoako-Sakyi, 2013).

In larger cities where commercial and access-driven pedestrian activities are pronounced, the inconveniences of the walking space are prominent. This influences the liveability and overall accessibility of the city (Asamoah et al., 2013). Accra, the capital city of Ghana, is an example of an economic centre with key corridors with high traffic congestion and high pedestrianisation with less support for the latter in infrastructure and other traffic calming measures.

Transport planning, especially non-motorised transport (NMT), receives less in the Ghanaian planning policies and infrastructural development. There has been a lack of communication and coordination in the strategies and approaches with various institutions to develop a comprehensive and reliable transport system for the long term (National Transport Policy, 2008). However, the Pedestrian Road Safety Action Plan 2018-2022 for the Accra Metropolitan Area (AMA, 2017), coordinated and led by the assembly, aims to develop an inclusive strategy to cater for pedestrian safety, with the involvement of institutional agencies, the Ministry of Roads and Highways (the department of Urban Roads; Ghana Highways Authority), the National Road Safety Commission (NRSC) National Road Safety Authority. The Police MTTD, the Department of Education, and the Department of Health in the Accra Metropolitan Assembly. Essentially, this document acknowledges that the need to have a well-maintained walking environment is critical for promoting walking and reducing pedestrian risk and fatalities. However, pedestrian fatalities are still on the rise (Stucki, 2020).

Moreover, it is recorded that walking-only trips in Accra cover about one-tenth of all trips (AMA, 2017). As noted earlier, most people in the Accra Metropolitan Area (AMA) contribute to this proportion because they cannot afford for trotro[1] and taxis (Stucki, 2020). Thus, these trips usually provide access to public transport and commercial activities. However, there is not enough infrastructure to support these journeys. The Accra streets are taken over by unregulated commerce, hawkers, a prevalent situation in the CBD and taxis waiting on passengers (Amoako et al., 2014). The pedestrian constantly competes with traders and hawkers for space (Solomon-Ayeh et al., 2011). These social activities in the pedestrian environment hinder walking and discourage pedestrians from choosing walking as their mode of transport.

In most cases, spaces allocated for pedestrians are installed as secondary matters, leaving the pedestrian environment susceptible to encroachment and invasion by informal traders, hawkers, and on-street parking (Amoako et al., 2014). Thus, pedestrians experience conflicts and obstructions, such as open trenches and gutters, missing pavement blocks, and uneven surfaces. These conditions pose a risk to the safety and convenience of pedestrians. Hence, the challenges pedestrians face on roads while on the move cannot be ignored in the planning and design, especially since road transport remains a primary mode of transportation in Ghana (Amoako-Sakyi, 2013). Whereas this is unfavourable to the pedestrian, it contributes to the overall walkability of the place and the perceived mobility wellbeing of pedestrians. Suggestions for improvement will be to advocate for integrating transport planning and land use planning firmly. Following the National Transport Policy on NMT Ministry of Transport (2020), there is there need to "provide dedicated safe, reliable and appropriate facilities for NMT users across all transport modes."

Societal Relevance

There is a need to plan and design a walkable pedestrian environment while considering how the various social, environmental, infrastructural, and environmental conditions translate into spatial conditions because a lack of drive for an activity is likely to result in a lack of opportunities to use it (van Wee et al., 2013).

This research explores the walkability conditions in the CBD of Accra Metropolis to provide means of improving the framework and guidelines for promoting walkable environments. It assesses the walking environments and the planning processes to suggest novel and sustainable means of improving the quality of life of pedestrians in Accra. Doing so will help improve the liveability and mobility wellbeing of pedestrians in Accra linking design and planning practices and using such insights to achieve an inclusive and considerate transport system.

Academic relevance

In sum, this study is relevant to academia by contributing to interdisciplinary research on walkability by using geospatial tools via QGIS to provide a normalised aggregated method of understanding the conditions of the walking environment to inform the impact on the mobility wellbeing of pedestrians. Subsequently, adding to academic discussion on walkability from the perceived mobility wellbeing perspective. This research highlights on the need to advocate for mobility wellbeing as the experiences of pedestrians of their walking environment in walkability considerations in the planning and designing of sustainable cities.

1.4 Problem Statement

The insights above show that the infrastructure and services provided to improve the city's walkability are inadequate or, worst – in bad condition. Often, these facilities are provided as add-ons to existing roads or general plans (Amoako et al., 2014). As more attention is given to fixing and creating more roads for motorised transport, less attention is given to pedestrians. There are sidewalks in lousy shape or completely missing because of the cost of production and maintenance (Forsyth & Southworth, 2008).

Looking at these vulnerabilities that pedestrians are susceptible to in the Ghanaian context, there is a need to understand walkability and the planning standards in the local setting. Studies on walkability and mobility have been conducted in the European, American, and South Asian contexts (Dovey & Pafka, 2020; Ewing & Handy,

[1] An informal minibus for public transport

2009; Lo, 2009; Manifesty, 2021; Southworth, 2005). However, barely do these studies focus on the African context. Given that in these locations where walkability studies have emerged solely intend to encourage more walking as an activity. However, in the local regions where walking is an asset for basic transport, major considerations are not made for pedestrian activities.

Using walkability as a baseline, existing research on the concept have not considered much what the conditions in the walking environment influence the wellbeing of pedestrian. Thus, understanding mobility wellbeing is pertinent is defining what is walkable or not. This research uses a normalised aggregation of indicators of walking conditions in the walking environment to explore the influences on perceived mobility wellbeing.

1.5 Objective and research topic

The main objective of this research is "*To explore the walkability conditions and the potential for improving the perceived mobility in Accra Central Business District (CBD)"*. Specifically, this research seeks to

- Provide insight on the current spatial and non-spatial conditions and planning processes of the walking environment in the CBD, Accra.
- Explore planning and design guidelines and strategies for improving spatial and non-spatial conditions of the walking environment to encourage walkability in CBD, Accra.
- Ascertain the influence of walkability conditions on the perceived mobility wellbeing of pedestrians.

1.6 Research questions

To reach this research's key objective, the main research question is "*How do the spatial and non-spatial conditions in the walking environment affect walkability in Accra to influence the perceived mobility wellbeing of the pedestrians?"*. The following sub-questions provide a further understanding of the objectives.

- What are the existing walking conditions (spatial and non-spatial) and planning processes of walking environments in the CBD, Accra?
- What are the optimal spatial and non-spatial conditions to encourage walkability?
    - How do the optimal spatial and non-spatial conditions translate in the planning and design guidelines and strategies to encourage walkability in the CBD, Accra?
- How is the mobility wellbeing of pedestrians determined?

1.7 Structure of report

This research is organised into seven chapters. Chapter 2 shows the literature review with relevant operationalisations for this research which builds on an operationalised definition for walkability in the Ghanaian context. From this definition, the researcher draws further on Forsyth's (2015) walkability framework to develop a conceptual framework supported by the performance theory of (Mastop & Faludi, 1997). Chapter 3 embodies the research methodology and research design. It provides brief information on the data collection and analysis methods by showing some examples of analysis and collection methods. Chapter 4 looks at the case and context description by highlighting an overview of walking and planning processes in the CBD. Chapter 5 shows the results according to the conceptual framework and the measurements used with this research. Chapter 6 provides the discussion of findings according to each research question. Chapter 7 shows the conclusions on each research question and answers the main research question, which relates to the results, conceptual framework, and recommendations for further studies. The final Chapter 8 covers the list of relevant references.

CHAPTER 2

THEORETICAL FRAMEWORK

Source: https://www.instagram.com/p/CMtnA6tpTQt/

2.0 THEORETICAL FRAMEWORK

In addressing the recent call for sustainable mobility, walkability has been a concern for main cities and regions. A key concern is that the study of walkability is focused on walking behaviour, spatial attributes or the experience, however not together. It is essential to understand the reality of walking environments, their adverse influence on defining walkability, and the role these environments play on the overall experiences of pedestrians altogether. For this reason, this research focuses on walkability and perceived mobility wellbeing of pedestrians. By doing so, this chapter looks at the following concepts.

i) Walkability
ii) The walking environment (spatial and non-spatial conditions)
iii) Mobility wellbeing

2.1 Understanding walkability

In recent times, the surge in exploring walkability has led to various definitions of the concept. While most researchers have established that it is not implicitly possible to define walkability, others have conceptualised it in various scenarios. Various disciplines have defined it, and the most common definition suggests walkability as encouraging physical activity. However, this cannot possibly be the case for all scenarios. Walkability is more than physical activity. In view of Dovey & Pafka (2020), the concept is way more complex than it seems and should not be limited to or based on how much walking you do. Walkability is expressed in terms of the experiences of pedestrians and how they perceive the environment.

Drawing on the conventional definition of walkability, the quality of the walking environment supports walking. Lo (2009) suggests the multi-disciplinary definitions fit in to justify promoting walking. For instance, in urban design scholarly works, walkability is defined by the ability of the environment to possess 'improved' qualities (design and perceptual) that encourage walking (Ewing & Handy, 2009; Kelly et al., 2011). In planning, the literature finds walkability as walkable - considering accessibility, most importantly, in terms of infrastructure and cost (Forsyth & Southworth, 2008; Southworth, 2005). From the interdisciplinary urban design and planning aspect, walkability is considered to exist different conditions represented in the urban morphologies (Dovey & Pafka, 2020).

On the stance that walkability is not only about physical activity, zooming in on the research by (Dovey & Pafka, 2020), they investigate the complexity of walkability using dimensions of density, mix and access. In their analysis, they considered the factors such as topography, microclimate, aesthetics, and safety, leaving out the experiences of pedestrians of these dimensions. Moreover, they acknowledge that physical characteristics of the walking environment, such as the terrain and weather, hinder its walkability while the attractiveness and comfortability enhance it. This is indeed optimistic considering whether the experiences individual(s) have of the walking environment make it walkable or not. Thus, these conditions are not to be put on hold until other conditions are met, as Dovey & Pafka (2020) suggest but studied synchronously.

Considering how accommodating it is for pedestrian journeys for whatever purpose from the origin to destination. Other authors explain walkability by identifying the presence or absence of the walking conditions, what they refer to as micro and macro features in the walking environment (Clifton et al., 2007; Rigolon et al., 2018). The micro-scale features are physical and useful to the pedestrian, such as the presence of crosswalks, sidewalks, obstructions, amenities, and shade trees. In contrast, the macro-scale features include land uses, traffic density, and connectivity, among others, aimed toward pedestrian behaviour (Rigolon et al., 2018). It should be noted that focusing on the absence or presence of the conditions or features is simply evaluating the infrastructure and walking environment and not necessarily what it provides as service and consequently how people experience it. Without assessing the experiences of the pedestrian towards these features, it may not give an overall picture of what is walkable.

The subjectivity of the experiences can be explored to determine what is walkable for all and how the ultimate satisfaction can be derived from the (walking) environment. This study builds on the subjectivity of defining what is walkable through people's experiences and perceptions. As established in earlier studies, the pedestrian is more exposed to the environment than other modes due to the nature of movement and has a broader range of experiences.

As already pointed out, the definition of walkability includes the perception and experiences of the pedestrian aside the physical conditions that enhance walking (Lo, 2009; Manifesty, 2021); if not, the question of what is walkable can only be determined by the designers and planners of the walking space by the performance. Moreover, several authors have been able to identify that through the physical features in the environment facilitate walkability, other elements like the safety, comfort, attractiveness, and convenience of the environment enhance it (Dovey & Pafka, 2020; Forsyth & Southworth, 2008; Litman, 2003; Lo, 2009; Manifesty, 2021; Nuzir & Dewancker, 2016). Therefore, it is imperative to consider the attributes of the walking environment, the conditions it provides and how pedestrians perceive them.

On the other hand, Lo's (2009) walkability assessment stems from compiling the commonalities across all disciplines that define walkability. The indicators include the following;

- *Presence of continuous and well-maintained sidewalks*
- *Universal access characteristics*
- *Path directness and street network connectivity*
- *Safety of at-grade crossing treatments*
- *Absence of heavy and high-speed traffic*
- *Pedestrian separation or buffering from traffic*
- *Land use density*
- *Building and land-use diversity or mix*
- *Street trees and landscaping*
- *Visual interest and a sense of place as defined under local conditions*
- *The perceived or actual security* (Lo, 2009).

These common denominators are developed as walkability measures drawn from assessing the flow capacity of the pedestrian environment, multimodal connections available, the sense of place and aesthetics, the availability of civic engagement, and public health and active living (Lo, 2009). A place is walkable depending on the attributes of the environment to encourage walking (Kelly et al., 2011). This fact remains undisputed; however, it is a slight stretch from reality.

Drawing on the arguments above, Ewing & Handy (2009) add that the physical features in the walking environment may not exclusively put out the experience of the walking environment. They further establish that these features may influence the perception and experiences of the individual(s) of the environment. Furthermore, there are attributes that the walking environment possesses that denote walkability. Forsyth (2015) identifies these attributes as the means of achieving walkability, however physical or non-physical, they

may appear in the walking environment. Such situations include the presence of sidewalks, availability of crosswalks (controlled or uncontrolled), available land uses, easy connections to other modes of transport, traffic, and personal safety, amongst others. It is the presence of these elements that propel walkability. Thus, as previous studies simplify the definition of walkability as the quality of the walking environment, they implicitly refer to the abovementioned elements.

2.1.1 Identifying the means of walkability

Forsyth (2015), in developing a framework for walkability (*see Figure 1*), proposes two definitions for walkability. The first one suggests that a place is walkable if it provides the most basic conditions for walking: ease of access in combination with compactness and safety. The second definition suggests that walkability can be defined based on the expected outcome. The former definition is identified in the framework as the 'Means'.

The means comprise (1) **traversability**, (2) **compactness**, (3) **physical enticement**, and (4) **safety** of the pedestrian environment (*Figure 1*). However, this research focuses on the first three components (*see Figure 2*) of the walking environment, namely, traversability**,** which refers to the ease of accessibility, physical enticement meaning the attractiveness of the environment and compactness, which is the density of the built environment leaving the safety of the pedestrian environment to be tackled as the perception of the pedestrian of their environment under mobility wellbeing in subsequent paragraphs.

The assumption of the framework above may be true for various contexts and location wise. Especially noting that the outcomes are more towards encouraging walking behaviour. The objective is to encourage more physical activity in different parts of the world - Asia, Western Europe, and America, where walkability studies have advanced. The studies focus separately on behaviour, infrastructure and user satisfaction. However, in

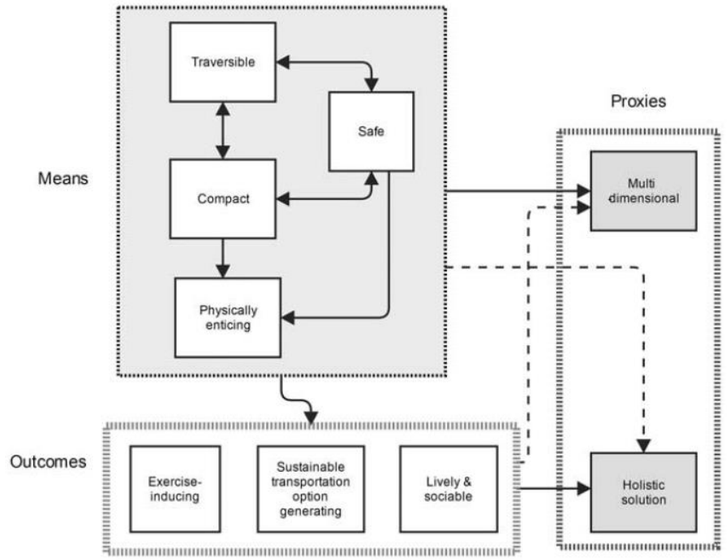


Figure 1 Framework linking definition of walkability and walkable places

Source: Forsyth (2015)

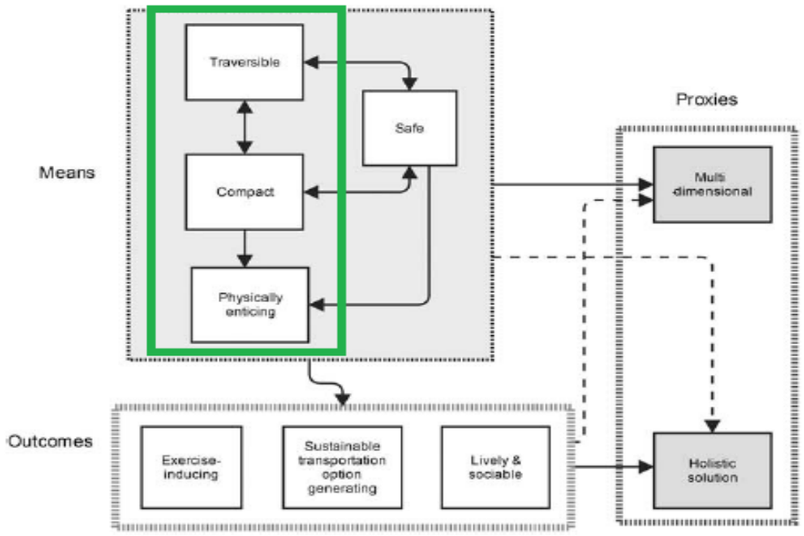


Figure 2 Framework focus

Note: highlighted in green box

sub-Saharan Africa, where there is relatively more potential for walkability, it is necessary to combine walking behaviour, the infrastructures, and user satisfaction to understand walkability. It leaves room to explore this in the Ghanaian setting, adding Forsyth (2015) and Lo (2009) on the perception of pedestrians of the identified means of walkability.

2.2 Walkability in the Ghanaian context

This research focuses on walkability, encouraging a barrier-free and attainable, realistic, and comprehensive pedestrian infrastructure and destinations. Therefore, in this research, I define walkability as the following, as inspired by Lo (2009), Forsyth & Southworth (2008) and Forsyth (2015).

> ***Walkability is the intrinsic performance of the walking environment, which considers (i) the pedestrian space (as a separation from other vehicles or land uses) to be maintained well enough with pedestrian infrastructures such as demarcated sidewalks, crosswalks, and sufficient lighting, as well as green spaces (ii) to improve the traversability, physical enticement and compactness to support pedestrian journey and mobility wellbeing*****.**

This definition would suggest that walkability is the ability of the spatial and non-spatial conditions of the walking environment to support pedestrian journeys when sidewalks, crosswalks, lighting, and green spaces are well-maintained. Thus, an area's walkability reflects the infrastructure, the physical and environmental conditions, and the perception of the individual pedestrian. These conditions are therefore translated into spatial terms in this research.

2.3 The Walking Environment (the spatial and non-spatial conditions)

From Forsyth's (2015) explanation, the walking environment is the underlying factor that propels walkability. Because the author implies that other than the means for walkability, the other factors such as outcomes and proxies all rely on or exist in the walking environment.

The walking environment is characterised by the conditions that are present in it. Conditions influencing walkability in cities include socio-economic, environmental, and physical factors and individual pedestrian attitudes. In this environment, perceptual qualities are developed and identified (Ewing & Handy, 2009). Of these conditions, some appear to be more spatial than others. This creates the category of *spatial* and *non-spatial* conditions of the walking environment. These aspects include a combination of the environmental, social, physical, and infrastructural factors like the walkability measures identified by Lo (2009). In this research, the conditions are collectively referred to as the *walkability conditions*. They are evidence of the environment's traversability, physical enticement, and compactness. Both spatial and non-spatial conditions make a place walkable directly or indirectly.

It is worth noting some characteristics of the spatial and non-spatial conditions. Firstly, these walkability conditions exist in the environment created for walking regardless of a clear delineation of the walking (pedestrian) environment. This is to say that where pedestrians can walk, there is a likelihood of creating or identifying existing spatial and non-spatial conditions. Secondly, there is an underlying relationship between the conditions and the walking environment in which they exist. Although the relationship is not directly established, it is noted as it directly influences the performance of the walking environment to promote walkability. The spatial and non-spatial conditions must be well identified and appreciated to create and enhance the walking environment and its conditions (Nuzir & Dewancker, 2016), elaborated in the subsequent paragraphs.

2.3.1.a. The spatial conditions

The spatial conditions of the walking environment are physical and can be attributed to varying urban activities in space. Examples of such conditions are the presence and maintenance of pedestrian facilities (sidewalk, crosswalk, street furniture), the multimodal connection of street network, heavy and high-speed traffic, pedestrian separation from traffic, the land-use diversity and density available, availability of trees and green spaces (Lo, 2009). For this research, these spatial conditions have been condensed as flow capacity (Lo, 2009), path quality (Southworth, 2005), path connectivity (Lo, 2009; Southworth, 2005) and path continuity (Southworth, 2005).

2.3.1.b. The non-spatial conditions

The non-spatial conditions of the walking environment constitute the non-physical attributes of the urban environment. It mostly resonates with an individual or group's subjective experiences, perceptions, and feelings about the(ir) walking environment. Some examples of non-spatial conditions of the walking environment are the liveability and sense of place (Forsyth, 2015; Lo, 2009), personal and traffic safety of pedestrians (Forsyth, 2015; Litman, 2003; Lo, 2009), comfort and convenience of pedestrians.

Similarly, what is identified by Forsyth (2015) as the outcomes for promoting walkability, such as inducing walking as a physical exercise, providing alternative sustainable options for transport offering a lively and sociable environment for inhabitants (see *Figure 1*), are non-spatial conditions of the walking environment. However, the non-spatial conditions may also be identified and qualified by the presence or absence of the spatial conditions.

Although not well developed in most literature, such as (Bozovic et al. (2021), this creates a mutual connection within the subcomponents measured as spatial and non-spatial conditions- they influence the perception of the non-spatial conditions. For example, a well-connected pedestrian network encourages social interaction and improves liveability (Lo, 2009; Southworth, 2005). On the other hand, the non-spatial conditions act as outcomes (such as liveability, sense of place, and safety) for designing and planning a walkable space considering the spatial conditions.

2.3.2.a Mobility wellbeing of pedestrians

Pedestrian experiences are different for different types of people. Thus, mobility wellbeing can be highly subjective. It is assessed by considering safety, comfort, and convenience perceptions. In walkability and pedestrian planning research, the pedestrian's safety, comfort, and convenience are defined as a subcategory of walkability. However, this research investigates wellbeing these conditions separately under the concept ‘mobility wellbeing'. Mobility wellbeing can be seen as described as the satisfaction that one derives from choosing to walk. Although it has not yet been conceptualised yet in literature, it is often discussed in studies as a condition to promote walkability and developing associations between the built environment and walking behaviour and walking needs (Bozovic et al., 2021; Forsyth, 2015; Sarkar et al., 2013).

The experiences encourage people to walk (Manifesty, 2021) because reports reveal that pedestrians interact more with their surroundings (Kelly et al., 2011). Thus, implying that they are more exposed to the spatial and non-spatial conditions present in their vicinity, thereby affecting their mobility wellbeing. For this reason, the walking environment is identified first with the conditions present, then determined who is affected by the conditions and how they experience and interpret them. In this case, there are two questions:' what are the conditions?' and 'for whom do these conditions impact?' measured by the perception of the attributes of the walking environment experienced and reported by the individual(s).

It should be noted that assessing the experiences of pedestrians in a walking environment could be challenging to determine because different demographics use the walking environment for various reasons and may experience it differently. Second, the experiences of a person familiar with the routes may be completely different from that of a tourist or a visitor. As such, exclusions might be necessary for a preliminary study to get a clear overview of what exists.

2.3.2.b Mobility wellbeing components

The following are components that are subjectively investigated to determine the mobility wellbeing of the pedestrians. They are the perceptive elements used to evaluate walkability conditions in the walking environment by recording the individual perceptions and experiences of the conditions that influence their mobility wellbeing however they understand and perceive it.

1. Safety – Literature (Amoako-Sakyi, 2013; Raford & Ragland, 2004; Southworth, 2005; Villaveces Dr. et al., 2012; Visvizi, Assem, et al., 2021) emphasize on safety is a strong determinant of a person's choice of mode of transport.
    a. Vehicular safety – Pedestrian separation reduces the vulnerability of pedestrians to impending vehicular traffic, with a clear delineating of the walkways with buffers away from the main roads.
    b. Personal safety – ease of movement by pedestrians without being attacked or endangered

c. Crime – exposure to other environmental and social conditions that provide an avenue for thieves.

2. Convenience – for all age groups and physically challenged. This considers how much of the walking environment provides easy access and use for pedestrians (Southworth, 2005). The convenience of a walking environment may likely increase the propensity to walk by active persons.
3. Comfort – an avenue for relaxation with meeting and rest stops to enhance the pedestrian journey. According to Lo (2009), the capacity of the sidewalk, for instance, impacts pedestrian comfort.

2.4 The performance theory (Mastop & Faludi,1997)

In this research, the performance theory is used to identify the functionality of the walkability conditions in the walking environment for promoting walkability and the perceived mobility wellbeing of pedestrians. It assesses the spatial conditions in the walking environment (pedestrian space). It further helps ascertain whether the pedestrian space with the optimal walkability conditions is adequate and effective enough to promote walkability. Moreover, it informs how to create the optimal spatial conditions translated into design and planning guidelines and strategies to encourage walkability in Accra.

The theory could help provide strategic ideas of how activities, plans and design could be actualised considering the effectiveness and comprehensiveness of such strategies and guidelines beforehand (Mastop & Faludi, 1997).

2.4.1 Performance

The Collins Dictionary defines performance as "the manner in which or the efficiency with which something reacts or fulfils its intended purpose" (Collins Dictionary, n.d.). Plan and policies are evaluated in spatial planning to assess their performance (Mastop & Needham, 1997). This is done to investigate whether elements of the plans live up to what it is expected to do (Feitelson et al., 2017; Mastop & Faludi, 1997). It may not matter much what stage the plan is at so long as indicators can be evaluated to determine how the plan works.

Various studies have pointed out that plans increase the expectations with their proposed objectives (Feitelson et al., 2017). This is to say that the objectives set in these plans are not actualised all the time. The performance concept looks at the connection between plans and decisions and the outcomes of these decisions(Mastop & Faludi, 1997). How does the plan influence the decisions of policymakers or actors? Do these decisions, in turn, affect what the outcome will be? As gratifying as the answers to these questions to determine a plan's performance, (Mastop & Faludi, 1997) emphasise that performance is not always reached by adhering to the initial plan. Knowing this would help identify the plan's full potential before and after execution. Therefore, evaluating the plans or policies at various levels is crucial. These evaluations usually come from assessing the plans (projects or policies) and the indicators presented in them.

There is a clear difference between the assessment for infrastructure and plans and policy documents. For this research, this theory takes policy and planning, documents available for pedestrians and road planning to investigate the performance of the walking environment. Investigating this plan and policies' performance will mean figuring out the extent to which specific indicators are present and functioning. However, it is worth noting that the performance perspective does not hold a crucial part in this research – it provides an understanding of how an evaluation of the walking environment for the pedestrian would look like to augment decision-making and development. It also calls for the involvement of certain actors that are key to initiating the plans. As Mastop & Needham (1997) acknowledge, the performance perspective of assessing plans also considers the actors' views involved in initiating the plan (or policy).

2.5 Conceptual framework

To better understand the walkability conditions in the walking environment and the influence of walkability to influence perceived mobility wellbeing, the walking environment is defined through spatial and non-spatial conditions. The performance of the conditions suggests walkability. Whereas the quality of the walkability directly impacts perceived mobility wellbeing. The conceptual framework (*Figure 3*) depicts a direct relationship between the Walking Environment, Walkability and Perceived Mobility Wellbeing.

Walking environment

The walking environment comprises the spatial and non-spatial conditions, a compilation of various physical, environmental, social, and infrastructural conditions. They are collectively known as walkability conditions. The spatial conditions (see *2.3.1a*) identified by the physical conditions in the urban environment include the flow capacity, connectivity, continuity, and physical quality of the path. The non-spatial conditions are the liveability of the place, the sense of place, safety, comfort, and convenience. They are the experiences, perceptions and feelings present in the urban environment. Hence the direct influence of the walking environment on walkability (see *Figure 3*).

According to performance, the performance of the walking environment is assessed by evaluating the presence and absence of walking conditions (spatial and nonspatial) in the walking environment. It is supplemented by the performance theory assessing the ability of policies and plans concerning it to ascertain whether it exhibits the ability to function according to what is planned. The walking environment is seen as the critical factor that influences a place's walkability by providing for the traversability, physical enticement and compactness of the environment to provide for the perceived mobility wellbeing of pedestrians. Hence evaluating its performance is deemed necessary in this study

Walkability

Walkability is then determined by a combination of attributes that are indicators of the impact of the walkability conditions in the walking environment. These elements provide the means to achieving walkability. It has to do with how easy it is for people to get to the walking environment (traversability), how attractive it is to make people want to go for a walk (physical enticement), and how dense the built environment is where the walking environment is defined (compactness) (see 2.2).

By quality, the walkability is assessed by identifying the extent to which the walkability conditions function (see *Figure 3*). Quality is not just in terms of the physical and non-physical attributes but also the experiences. A subjective assessment of the quality of these elements explains the perceived mobility wellbeing of the pedestrians.

Perceived mobility wellbeing

Moreover, a person's perceived mobility wellbeing is based on how they feel about the walkability of the environment and how well it meets their needs from the existing walkability conditions. This means that walkability directly contributes to the perceived mobility wellbeing, judged by the following factors: the perception of safety, convenience, and comfort (see *Figure 3* below). It also depicts an implicit impact of

the quality of the spatial and non-spatial conditions on how well people feel about their satisfaction from choosing to walk, as mentioned above. This means that when looking at the overall quality of the walking environment, it would be important to consider the perceptions of pedestrians seeing this environment and how they feel about it.

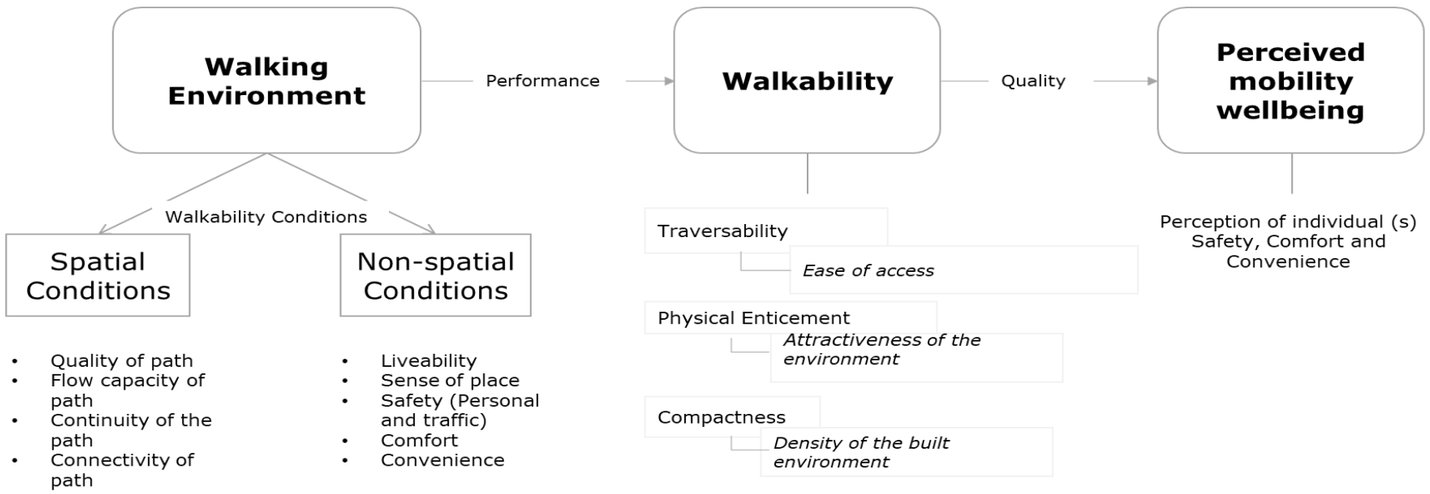


Figure 3 The performance of the walking environment to improve walkability its influence on perceived mobility wellbeing

CHAPTER 3

METHODOLOGY

Source: https://www.instagram.com/p/CIGT_5fhrCR/

3.0 METHODOLOGY

To explore the walkability conditions in the walking environment and the potential for improving the perceived mobility wellbeing in Accra CBD, mixed methods are explored to determine the performance of the walking environment and perceived mobility wellbeing defined through walkability in a case study of Accra CBD Ghana. In previous chapters, it has been established that walkability could impact the perceived mobility wellbeing of pedestrians. Thus, the researcher stands on the impression that the objective performance of the walking environment determines the quality of the walkability. This quality of walkability is also established through individuals' perceptions directly or indirectly of the walking environment.

This chapter justifies the research design chosen with the phases of research. It further gives an account of the collection and analysis methods and justifies ethical considerations and the researcher's positionality.

3.1 Research Design

This research is an exploratory case study using a mixed-methods approach, including text analysis, semi-structured interviews, and spatial analysis. The research design allows various qualitative and quantitative data collection and analysis approaches. These two approaches, with data collected and analysed separately, give an in-depth and detailed insight into exploring walkability and the perceived mobility wellbeing of pedestrians. An exploratory case study was appropriate because it offered the researcher an avenue first to acquire and analyse qualitative data that informs variables analysed using quantitative means (Creswell, 2015).

The qualitative approach of doing the field observations, interviews, and text analyses gives insight into the Ghanaian context of walkability and the perception of mobility wellbeing in the case of Accra. Quantitative data further complement this approach through spatial analysis, making things measurable and comparable. Researchers have embraced the prospects of using mixed methods, which helps create unique and creative results and analyses using the different measurement scales they provide (Creswell, 2015).

The choice of mixed methods design was necessary due to the nature of research questions developed for the study, which helped convey a message using multiple aspects of interpretations and understanding of a phenomenon (Bryman, 2006; Creswell, 2015). The following section shows how the mixed methods are visualised and synergised in various phases to execute this study.

3.1.1 Phases of research

In this section, the researcher presents a series of phases in which the research is conducted (see *Figure 4*). Six phases are linked to the research questions and the needed inputs to execute them, and it also shows the dynamic relationship between the phases and the central objective. From *Figure 4* below, the variables at each phase provide an input or output to the other phase, showing how the main phases are related to each other. The subsequent sections show what is needed for each variable and how they are collected and analysed.

Phase 1: [Preliminary content analysis (Literature Review and Media analysis]

This phase provides a baseline to develop what is on the ground as walkability and the possible conditions. It also provides the researcher with a training ground to know what in terms of the walkability conditions is -the spatial and non-spatial, especially in the Ghanaian context

Phase 2: [Observations of walkability conditions; spatial and non-spatial]

At this phase, the researcher already has an overview of the possible conditions and the indications. In addition to that, there are observed on the field using Google Street view to evaluate what is there or not.

Phase 3: [Spatial Analysis with QGIS]

Form the observations, and the data is shown in the geospatial environment to exhibit whether some routes are walkable or not.

Phase 4: [Interviews with experts and pedestrians]

Two interview phases are undertaken at this phase with relevant experts on the Accra Metropolitan Assembly and the pedestrians in the study area.

Phase 5: [Policy Analysis (local and international)]

In this phase, the researcher looks at international (the Urban Mobility Indicators) and local standards and policies on pedestrian planning international standards –

Phase 6: [Developing and testing planning and design strategies and guidelines]

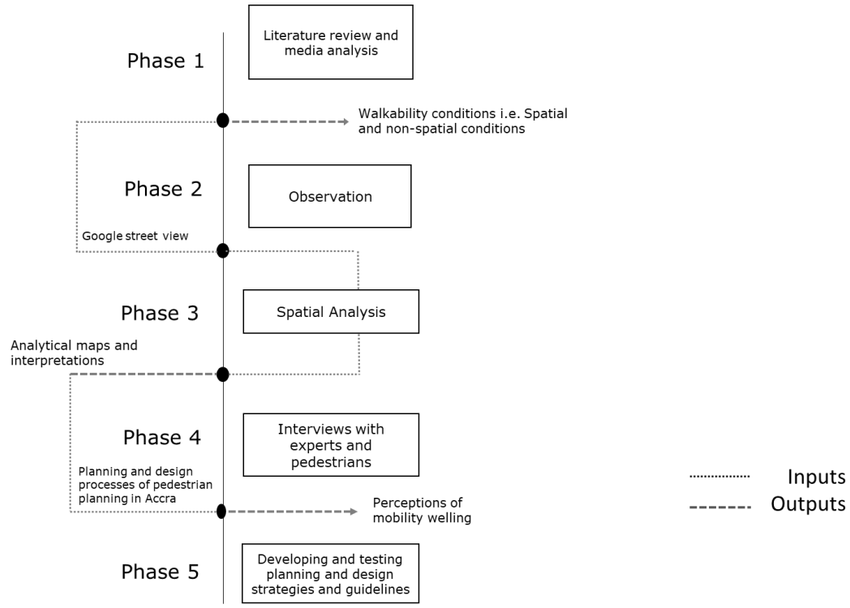


Figure 4 Phases of research

3.1.2 Study area and case selection

This study focuses on Accra, the capital city of Ghana in West Africa (see *Figure 5*). It is located along the Gulf of Guinea. The city is one of the largest cities in Ghana that provides various administrative, economic, and historical functions[2]. As such, it draws many locals and foreigners for a mix of activities. As walking is a common mode of transport in the city, it is important to provide good walking conditions that would make people enjoy the dynamics of the city.

This study takes a single case of Accra's central business district (CBD) area in the Accra Metropolitan Assembly (AMA). The Accra CBD is interesting for this research because it is the most concentrated area in Accra, with routes that house key corridors with high traffic congestion and intense commercial activities (see *4.0*) for. It is a central transportation hub for various Ghanaian dwellers and travellers, encouraging access-driven pedestrian activities. The CBD is bordered by the Ring Road, which runs over 18km long and connects major highways to other parts of the city and administrative region.

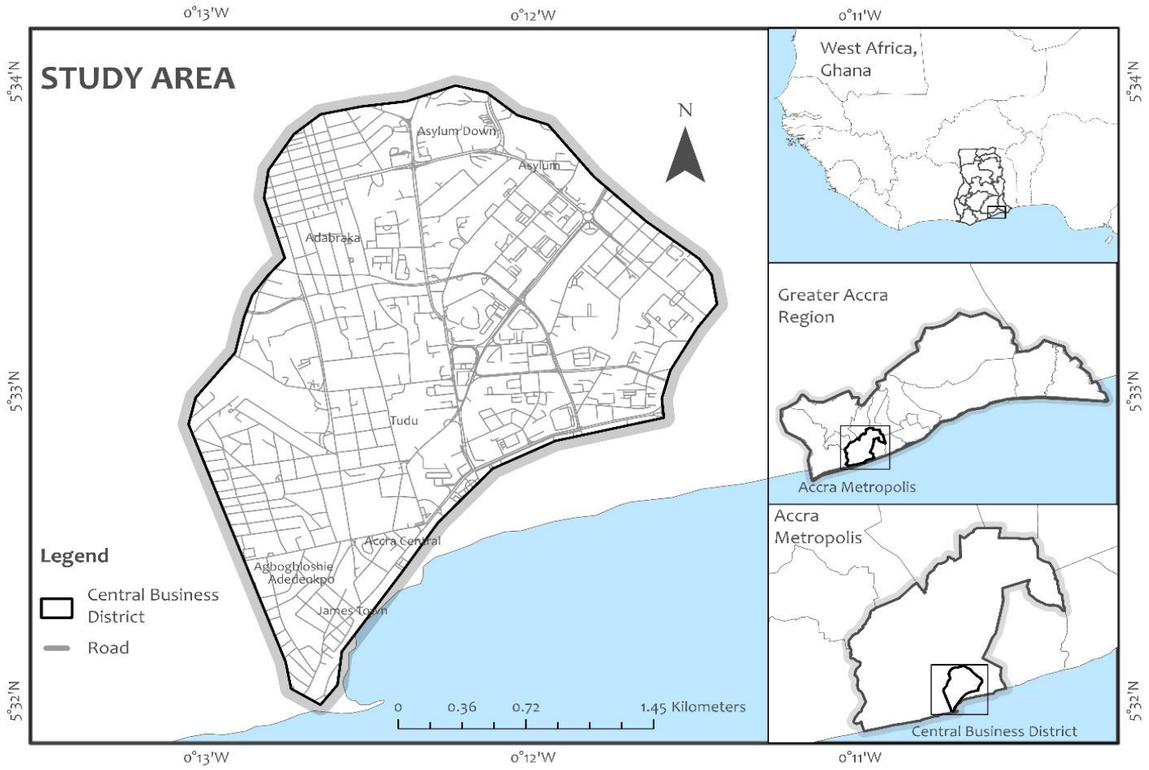


Figure 5 Map of study area - Accra Central Business District (CBD)

3.2 Data sources and collection

This research was interested in exploring the influence of walkability on individuals' perceived mobility wellbeing using quantitative and qualitative data. It gives an overview of the research questions with the necessary qualitative and quantitative data collection and analysis methods needed to execute them. The necessary data needed, sources, and analysis methods are outlined shown on *Table 1* below.

[2] https://www.britannica.com/place/Accra

Table 1 Research questions with data collection methods with analysis

Sub Research Questions (SRQs)	Data Needed	Data Collection Method	Data Analysis Method
What are the existing spatial and non-spatial conditions and planning processes of the walking environment in Accra?	(i) Spatial conditions and non-spatial in the walking environment	(i) Text from media	(i) Discourse (Text) analysis
	(ii) Academic articles on walkability	(ii) Literature review	(ii) Content analysis
	(iii) Street segment data	(iii) Field observations with Google Earth Street view	(iii) Score and map walkability conditions on the street segments to generate analytic maps
What are the optimal walking conditions to encourage walkability? →How do the optimal spatial and non-spatial conditions translate in the planning and design guidelines and strategies to encourage walkability in the CBD, Accra?	(iv) Pedestrian plans and documents of international standards, e.g., Urban Mobility Indicators (UMI)	(iv) Review of policy documents and reports like the UMI	(vi) Content analysis on the UMI framework
	(v) Walking indicators for Accra CBD	(v) Interviews with experts in the planning and design fields in Accra	(v) Review planning and design guidelines of Accra Metropolitan Assembly (viii)Analysis of UMI
How is the mobility wellbeing of pedestrians determined?	(vi) Perceptions on perceived mobility wellbeing	(vi) Interviews with pedestrians and other road users (profiling)	(vi) Transcribing and thematic analysis
	(vii) Literature on the components of mobility wellbeing (safety, comfort, and convenience)	(vii) Data cataloguing	(vii) Review of related literature

3.2.1 Spatial data

To have an overview and quantitatively assess the walkability conditions in the Accra CBD area, the following steps were taken to obtain and update spatial data as secondary data for this research.

Firstly, it was important to generate an arbitrary the boundary of the Accra CBD area from the total dataset of Accra using QGIS (see *Figure 5*).

Then I obtained existing road network dataset from open-source data – Open Street Map (OSM,2022). The data consists of 1095 road segments. The network layer was partially completed with several empty fields. It contains existing fields such as '*name*', '*name_en*', '*ref*', '*highway', 'oneway', 'maxspeed', and 'lanes'* (see *Appendix 5*). Relevant fields are only maintained in the attributes table. Other relevant datasets, such as buildings, were downloaded from OSM.

- An excel sheet was created to assess the spatial information generated for further analysis. It has columns for the layers to be created, the (non) spatial conditions they belong to, the type of data they would be, which dataset it is connected to, the source and the progress status (see *Appendix 5*)
- Where no data exists or is partially complete, the researcher sort to acquire data from NextGIS (2020), a commercial GIS company that provides spatial data. The data acquired from this source, however, was insufficient. Hence the researcher resorted to compensating for the unavailable data. This compensation was done by field observations via Google maps street view. Thus, providing a satisfactory dataset on (non)spatial conditions available for analysis (see *Appendix 5*).
- The observations were done on segment basis. The segments were developed by splitting the routes per 100 meters using QGIS split tool for observations. The researcher thus created unique identification (IDs) for all the segments summing to a total of 1837 new segments (see *Figure 6*). Where the road is a single carriage, the evaluation was done once for both sides.

100m_segments — Features Total: 1837, Filtered: 1837, Selected: 0

Update All | Update Selected

	cat	NAME	HIGHWAY	MAXSPEED	SURFACE	OSM_TYPE	OSM_ID	Traf_contr	Ped_facili	Path_obstr	Inf_mrkt	Lighting
1	1	Treasury Road	residential	30	NULL	way	71186772	NULL	NULL	NULL	NULL	NULL
2	1	Treasury Road	residential	30	NULL	way	71186772	NULL	NULL	NULL	NULL	NULL
3	10	Ministrries lane	service	20	NULL	way	265869196	NULL	NULL	NULL	NULL	NULL
4	100	Databank rd	service	20	NULL	way	909775579	NULL	NULL	NULL	NULL	NULL
5	1000	Akumale Street	residential	30	NULL	way	13783643	NULL	NULL	NULL	NULL	NULL
6	1000	Akumale Street	residential	30	NULL	way	13783643	NULL	NULL	NULL	NULL	NULL
7	1000	Akumale Street	residential	30	NULL	way	13783643	NULL	NULL	NULL	NULL	NULL
8	1001	Okomfo Sapai...	residential	30	NULL	way	13688108	NULL	NULL	NULL	NULL	NULL
9	1001	Okomfo Sapai...	residential	30	NULL	way	13688108	NULL	NULL	NULL	NULL	NULL
10	1001	Okomfo Sapai...	residential	30	NULL	way	13688108	NULL	NULL	NULL	NULL	NULL
11	1001	Okomfo Sapai...	residential	30	NULL	way	13688108	NULL	NULL	NULL	NULL	NULL
12	1002	High Street	primary	50	NULL	way	13781163	NULL	NULL	NULL	NULL	NULL
13	1002	High Street	primary	50	NULL	way	13781163	NULL	NULL	NULL	NULL	NULL
14	1003	John Evans At...	primary	50	asphalt	way	13781089	NULL	NULL	NULL	NULL	NULL
15	1003	John Evans At...	primary	50	asphalt	way	13781089	NULL	NULL	NULL	NULL	NULL
16	1003	John Evans At...	primary	50	asphalt	way	13781089	NULL	NULL	NULL	NULL	NULL
17	1004	John Pagan R...	secondary	50	NULL	way	13785497	NULL	NULL	NULL	NULL	NULL

Figure 6 Snapshot of road segments with initial attributes

3.2.2 Semi-structured interviews

To be able to determine the performance of the walking environment and the perceived mobility of pedestrians, two series of semi-structured interviews were conducted with experts and with pedestrians. The former involves interviews with experts in relevant offices of planning and design departments of transport planning in Ghana. This aspect forms a crucial part of the research in liaising with the practitioners of transport and pedestrian planning - combining the scientific and the practice to yield an interdisciplinary solution for improving walkability in Accra to influence the perceived mobility wellbeing of pedestrians. The second phase of interviews was done with pedestrians. The sections below tackle each interview phase.

Interview with Experts

Since this research is intended to propose ways improve the local pedestrian planning and design practices of the Accra CBD, it was necessary to speak to the local authorities and other relevant persons that are involved. The researcher purposively engaged experts in semi-structured interviews. A total of four interviews were conducted online via Microsoft Teams. These are persons from the Ministry of Transport- Ministry of Roads and Highway -Department of Urban Roads, Ghana Highway Authority and the Land Use and Spatial Planning office of the Accra Metropolitan Assembly (see *Appendix 2*). As mentioned earlier, the experts were mainly from government offices since this part of the research is directed toward policymaking and processes.

The interview was structured in two parts, designed to last an hour. Part A seeks to inquire about the performance of pedestrian planning in policymaking and planning processes in the AMA. Part B gives the interviewees a visual impression of the findings from an earlier spatial analysis in the form of analytic maps. This session gives the opportunity for the experts to react to the maps in terms of traversability, physical enticement and compactness. see *Appendix 3 for Expert interview protocol.*

Interview with Pedestrians

Semi-structured interviews were done purposively using a convenience sampling technique. Saturation was reached after the 24 respondents. The pedestrians were purposively targeted were adult respondents who are active users of the walking environment. The questions asked were made to get an idea of what mobility wellbeing means to them, how they experience it and how they are affected by walkability conditions.

Convenience sampling is a non-probabilistic sampling technique that essentially allows for easy access to research participants as they are available to the researcher (Bryman, 2004, p. 201). Participants are selected from four (arbitrary) sectors of the Accra CBD area. This made it possible to access participants across the CBD area conveniently. The interview with pedestrians was conducted in a proxy using (three) university students as research assistants who are well versed in conducting field research. The assistants were trained for two days on how to engage participants. The researcher was informed of all activities on the ground via WhatsApp communications.

The interview questions, along with the photos, were developed in Microsoft Forms to provide easy access. Larger versions of the photos were printed as hard copies for respondents who have issues viewing on mobile devices assisted by research assistants.

The interview was structured in three parts (see *Appendix 4*). *Part 1 Determining mobility wellbeing* ushers the respondents into a visual presentation where they assess the indicators of mobility wellbeing as Safety, Comfort and Convenience. For indicator, a series of eight photos (see *Appendix 4*) were presented showing good, moderate, and bad situations, respectively. The respondent was asked to rate (1-5 stars) the photos to indicate how (not)safe, (not)comfortable, and (not)convenient. *Part 2 Ideal walking environment* gives an avenue for participants to give an impression of their ideal walking environment. *Part 0 Sociodemographic background* of the interviewee which includes the gender, occupation, residence and daily/often used mode of transport.

It is worth noting acknowledging that the downside of convenience sampling is its weak external validity (Bryman, 2006). However, for this research it is necessary as it provides the foundation to propagate further research on walkability and mobility welling in Ghana (as exploratory as it is). It was, however, challenging to get pedestrians in their natural environment in the CBD to wait a while to be interviewed. Hence the interview period was hastened.

3.2.3 Media, policy, and literature

As secondary data, the researcher collected data from media (texts), news articles, scientific literature, and policy documents to gain insight into walkability and perceived mobility wellbeing locally and internationally.

Texts

Conversations were collected from Facebook, LinkedIn, Twitter, and news (blog) publications in the form of tweets and blog posts. This information was needed because it portrays the reality of the walking conditions in Accra, how people feel about it, and how they are reported in media conversations. This informs most on the societal problem of this research by identifying how walkability conditions are framed in the Ghanaian context. This is done to be abreast with the phenomenon (Altheide & Schneider, 2013).

Therefore, on these social media sites, some keywords were used in searching for such information – for example, *'Walking in Accra'*, *'Makola market'*, *'pedestrian in Accra'*. It was expected that the search results show posts by individuals over time. The individual's username or handles will be retracted from the text, thus making the individuals untraceable *(*see *Personal data, 3.8.2*).

Policy documents

Policy documents from local and international sources were selected and collected for this research. Local policy documents relevant to the AMA, such as the National Transport Policy (NTP) from the Ministry of Transport, Ghana, was retrieved online. Another key document was the Urban Mobility Indicators (UMI) also retrieved online. The UMI is an international policy document that focuses on promoting and achieving SDG 11.2 by ensuring "*accessible, safe, efficient, affordable and sustainable infrastructures for walking and public transport*"(Walk21, 2019). A policy document for sustainable mobility developed from the Walk 21 annual conference is also useful for assessing the optimal walkability conditions of a place. It elaborates on optimal practices that can be adopted for walking and pedestrian planning.

3.3 Data processing and analysis

As both quantitative and qualitative data are collected separately, they are analysed similarly. The data is cleaned and prepared in the following manner.

3.3.1 Text (Discourse) Analysis

As mentioned in the section above, text analysis (see Appendix 1) provides insight into the spatial and non-spatial conditions in the walking environment that influence walkability. Using text analysis helped discover discourses in media conversations and write-ups in their raw form. The documents were first coded and then analysed subjectively. The text analysis allows for a more thorough examination of what people talk about, giving the researcher more room to scrutinise people's reactions to the societal problem subjectively.

Moreover, the texts were analysed to identify the discourse and its construction. Three main questions were used to drive. These questions are derived from (Bryman, 2004) to help conduct the discourse analysis on the media text – "*What is this discourse doing?" "How is this discourse constructed to make this happen?" and "What resources are available to perform this activity?".* For example, a personal tweet (DA04, see Appendix 1) obtained from Twitter by an inhabitant of Accra goes like *"Ghana's Road Safety Commission needs to step up their messaging on pedestrian visibility. Drove 50km from Afienya to Accra and everywhere I could barely see the pedestrians on the roads. All they need to do is wear brighter clothing to increase their chances of staying alive!".* The answers to the line of questioning are 1. What is the discourse doing? – This tweet is calling to the attention of authorities on public education on the need for pedestrian visibility which implies safety for pedestrians. 2. How is this discourse constructed to make it happen? – The discourse is constructed as a call to action on pedestrian visibility. 3. What resources are available to perform this discourse? - A verified personal Twitter account (see *Appendix 1*).

3.3.2 Spatial Analysis

With the spatial analysis, the researcher relied on the preliminary information gathered from media and literature coupled with the field observations via Google Street view. The observations were guided by identifying the preliminary walkability indicators (see Appendix 5) below to be assessed on the road segments. From these indicators, the final walkability indicators were derived. Generally, the observation was necessary to get data for road segments for further composite analysis.

Composite grid analysis and data (dis)aggregation

Data (dis)aggregation allows for a more comprehensive and handy method of spatial representation analysis. It also provides grounds for merging statistical analysis with spatial data and simultaneous analysis (Burian et al., 2022). To ensure an appreciable spatial analysis of the Accra CBD area road network, the data accumulated were first disaggregated. The process follows in the subsequent paragraphs.

First, the road segment (line vector) was converted to polygon vector by creating a buffer with QGIS. A buffer distance of 15m was given to the road network to enable greater spatial analysis with the grids with reference to the average walking distance a person can see ahead (Dobkin, 2006). Hexagons were created using the QGIS Create Grid plugin with 30mx30m cell distance. This distance was chosen with reference to the initial buffer distance, which becomes the radius for the hexagon. The hexagon grid was chosen because it is easier to access the movement of pedestrians and their line of sight, and the conditions available to them at all angles. And, for easy representation of the walkable areas.

Second, the grids were clipped using the QGIS Clip tool to the buffer output of the road segments. This was done to attach the road segments to the grids, yielding a total of 5,942 segments. The area of the buffer and that of the hexagons are derived.

Third, the grid layer and the buffer layers were then aligned by the QGIS Spatial Join tool to aggregate the data. This was done to combine the data of the roads' segments with the grids. So, the grids have their unique IDs

$$\boldsymbol{R} = Ah/Ab$$

with the road data, regardless of the number of buffers in the same hexagon. Hereafter, it was necessary to find out how much of a buffer layer in a particular hexagon grid. Where ratios were generated for each grid id to identify the proportion of buffer layer per grid. This was done using the formula

where *R* is the ratio, ***Ah*** is the area of the hexagon, and ***Ab*** is the area of the buffer. The ratio calculated gives an impression of how much of a certain road segment buffer is contained in a hexagon grid. With this value, it was then necessary to calculate for each indicator or variable. Thus, for all 16,915-grid counts, each segment identifies what per cent is contained in the grid. By doing so, we calculate using the formula

new Indicator value *as*

$$= Indicator * R$$

therefore

Total composite value (TCv)

$$= SUM\ (new\ Indicator\ value)$$

Finally, the total composite now becomes a summation of all (new) 15 indicator values for 16,915 grid segments. The TCv gives an impression of the walkability index for a particular road segment. However, it is realised that out of the 15 indicators sampled, 3 indicators, namely 'street parking', 'informal market' and 'path obstructions, may contain pseudo values. A value of 0-1 is assigned to all other variables; the walkability index does not increase when any of these values are observed to be 1, ideally. For instance, segment A has path obstructions and a sidewalk, meaning the segment gets a score of 1 for the path obstruction and 1 for the pedestrian facility, respectively. The TCv would be 2, implying a 'high' walkability index. However, the presence of path obstruction may not contribute positively to the walkability of a route. Thus, such variables are negated before the TCv is derived. The initial TCv calculated gives a pseudo walkability index for the road segments. Hence, taking care of the negative indicators, we negate them before calculating for the TCv.

Therefore, true **TCv** is calculated with the formula

$$=new\ [Traf\_Contr + Lighting + Ped\_facili + (-Path\_obstr) + Amenities + (-Inf\_mrkt) + Green\_spac + Speed\_limi + Shade\_tree + Path\_mater + Building + (-Street\_Par) + Crosswalk + Path\_Clean + Path\_compl]$$

where *Traf_Contr* is traffic controls, *Lighting* is Lighting, *Ped_facili* is Pedestrian facility, *Path_obstr* is path obstruction, *Amenities* is amenities, *Inf_mrkt* is informal market, *Green_spac* is green spaces, *Speed_limi* is speed limit, *Shade_tree* is shade tree, *Path_mater* is path materials, *Building* is building, *Street_Par* is street parking, *Crosswalk* is crosswalk, *Path_Clean* is path cleanliness, and *Path_compl* is path completeness.

The following is a calculated example to show how the TCv is derived, using Nii Ahene Rd (see *Figure 7*), a residential road in Accra CBD area, Ghana, for illustration.

Box 1 Illustrating how to derive Composite Model for walkability conditions for a road segment

Nii Ahene Rd (ID:4288, see Appendix 5) has **Ah**= 510.159, **Ab**= 3039.735 then **R**= 0.17 (round two decimal place)

If the segment has the following scores for the indicators,

Traf_Contr= 0 Lighting= 1 Ped_facili= 0 Path_obstr= 1 Amenities= 0 Inf_mrkt= 1 Green_spac= 1 Speed_limi= 0 Shade_tree= 1 Path_mater= 1 Building= 0 Street_Par= 1 Crosswalk= 0 Path_Clean= 0 Path_compl= 0

Then **new indicator value** is

new_Traf_Contr= 0 new_Lighting= 0.16783 new_Ped_facili= 0 new_Path_obstr= 0.16783 new_Amenities= 0 new_Inf_mrkt= 0.16783 new_Green_spac= 0.16783 new_Speed_limi= 0 new_Shade_tree= 0.16783 new_Path_mater= 0.16783 new_Building= 0 new_Street_Par= 0.16783 new_Crosswalk= 0 new_Path_Clean= 0 new_Path_compl= 0

therefore, **TCv** = (0 + 0.16783 + 0 + (-0.16783) + 0 + (-0.16783) + 0.16783 + 0 + 0.16783 + 0.16783 + 0 + (-0.16783) + 0 + 0 + 0*)*

=0.33566

From the illustration above, the TCv for Nii Ahene Rd is 0.33566, which is the walkability index of that segment. The value indicates how walkable the segment is for pedestrians according to the indicators measured.

Calculating the TCv gives an overall impression and understanding of the walking conditions of the Accra CBD area.

Figure 7 Nii Ahene Rd, Accra, Ghana

(Source: Google Maps via Street view (2016) [Accessed on 17/06/2022 21:07])

3.3.3 Policy Analysis

The policy document analysis was necessary for Phase 4 of the research (see section 3.1.1). The researcher elaborates on how the walkability conditions could be tackled if and when the optimal conditions are met for the Ghanaian context, *ceteris paribus (all other things being equal)*. For the UMI, the researcher determines the ideal situation and the optimality in pedestrian planning toward walkability. The researcher also looked at how the best fit practices are applied to the themes of traversability, physical enticement and compactness and how they are defined for the environment considering the road attributes, the pedestrian facilities, and the street environment. The National Transport Policy document was also analysed in the same way. After assessing them differently, both documents were checked for commonalities. And level of operation (LOP) for the local document to see the extent it addresses issues of pedestrian planning and design towards walkability.

3.3.4 Interviews

The interviews were transcribed and cleaned by the researcher to make sure the data contains no errors. Where interviews were conducted in the local dialect (Twi[3]) it was translated and transcribed. The local dialect was used to get in-depth as well as detailed information from the respondents. Though some could express themselves well in English, the language was switched up to Twi to make participants comfortable in giving out the best expressions and opinions pertaining the study. Where recordings were inaudible due to the surroundings and market setting, important information were written down and cross-checked with the enumerators' notes. The transcripts were coded and classified into various themes of interest of walkability manually and with the help of Atlas.Ti (2022). With the interviews with the pedestrians, there were ones that were discarded because the participants stopped because they were in a hurry. This happened on serval occasion thus the enumerators were advised to assess three photos each for Part 2 (see 3.2.2)

Table 2 Information on units of analysis and respective codes

S/N	Unit of analysis	Code	Sample	Language
1	Experts	EXP-00	4	English
2	Pedestrians	PED-00	24	Twi, translated to English by researcher

In the analysis of the transcript, the researcher used both inductive and deductive reasoning. Primarily because the elements of walkability and the themes that the researcher was interested in were already preconceived. Also, deductively, though the indicators of mobility wellbeing, that is, safety, comfort and convenience were already predetermined but the researcher wanted to know what elements were most considered by pedestrians. Thus (re)coding and grouping the elements identified under the predetermined indicators.

3.4 Target population

This research is beneficial for the local government - the Accra Metropolitan Assembly (AMA), Transport policymakers, and Urban Roads and Highway authorities in Ghana. The analysis will provide a framework for setting standards in planning and designing the pedestrian walking environment to create a sustainable walking environment and pedestrian infrastructure in Accra. As such, the AMA, transport policy makers, and urban roads and Highway authorities and agencies in Ghana constituted the target population for this study.

3.5 Researcher's Positionality

As a spatial planning student, I have come to be abreast with issues of urban space and the implications on daily life and mobility withing the urban space. With these varying issues comes varying methods and approaches of getting the best outcome from research. My understanding of mobility and inspiration to take on the research on walkability and mobility wellbeing stems from my interest in how people experience the urban space across time and the impact on their wellbeing.

[3] Twi is a local dialect in the Ghanaian society. It is spoken by the largest ethnic group in Ghana thus mostly understand by most people

I am a Ghanaian - though not a resident of Accra, I have used the streets of Accra especially the CBD often. Thus, I am aware of the walking conditions intimately. It is thus from this position that I am documenting and indicating the frustrations – not as an objective bystander.

The question of perceptions on wellbeing and walkability is highly subjective. It is difficult to keep all biases away while tackling the issue of walkability in this local context. However, my curiosity to objectify the extent of the experiences and associated factors in spatial environment made be opt for mixed methods approach. With the methods I employed, the qualitative gives room to explore the untapped experiences of pedestrians of their walking. It also provides room for subjectivity especially on my side. The quantitative method via composite spatial analysis to produce the walkability index, gives an objective impression of the walkability situation in Accra. Using these two, I am able to make solid arguments without fear of bias or normative thinking. It also provided me with the opportunity to fully address the research question through objective and subjective assessment using mixed methods.

3.6 Ethical issues

3.6.1 Informed consent

Participants in this study were fully briefed on their rights, such as their right to withdraw from the study at any time. Interview participants were made aware of the purpose of the study. Additionally, they were reassured that the information they provided would be used for research and academic purposes only. All ethical grounds were tackled in accordance with the ethical standards of the Wageningen University and Research.

3.6.2 Personal Data

This research guaranteed the confidentiality and anonymity of the respondents. As indicated above, the participants were made aware of their rights to participate. During this research, the personal data of the respondents were tackled with uttermost confidentiality and rendered anonymous. The personal data of the in-depth interviews during the analysis were retracted and given aliases. Similarly, with the media analysis, the identities of persons were blurred or entirely cropped out. All data collected were kept in a folder on Teams, accessible only by the researcher and the supervisor

3.6.3 Validity

For every good research, it is necessary to account for the validity (internal and external). It helps figure out if the methods used in the research accurately measure what they are meant to measure and to question the generalisability of research (Bryman, 2004). For this study, the researcher identifies limitations that may threaten the validity of the research.

Walkability has been measured and assessed by various researchers using place specific criteria. The only similarity is the interpretations given to the indicators and the walkability conditions. They either look for an absence or encourage the presence. Nevertheless, the indicators remain universal to some extent, depending on who is talking. For this research, the indicators used were derived from literature, checked through texts from the media. To ensure a valid translate of in the local context. To also ensure that the conditions selected based on the media analysis were from mere rumours and speculations, observations were done using open-source spatial data. This provides information that is available to everyone and can be used in different locational contexts. Although the downside is that the data is crowdsourced, it still provides credible and verifiable means to assess reality. This reduces the increases the objectivity of the observations made. Though the use of convenience sampling prompts weak representativeness of the perceived mobility wellbeing of the entire population, it gives a steppingstone for further research and theories to be established on the subject.

Additionally, findings from this research can be generalised for other places with similar characteristics, especially in the social-cultural activities in the study area. Accra is characterised heavily by commercial activities, high traffic congestion, and pedestrianisation. It is likely the conditions present in the environment as such, in any other places in Ghana (or beyond), will produce similar walking experiences. The only limitation here will be the extent of the experiences and the severity of the conditions present.

3.6.4 Reliability

To ensure the researcher kept an organised assessment of the data collection for literature, interviews, media analysis and spatial analysis (see Appendix 5). This enabled accessible and retraceable information during and after the research.

The field observations (via Google maps) of the walkability indicators were categorised and weighted on the same level of binary value (0-1), making it easy to put all of them on the same scale. This provided room for greater consistency in results. Additionally, methods of data analysis especially for spatial data highly comprehensive and can be replicated. It is such that the researcher used open-source data that is available through crowdsourcing. Due to the source of this data, there may be some discrepancies that come with it. Thus, the researcher triangulated the data with other methods such as media analysis, literature review and interviews.

The indicators of walking conditions determined from the discourse (text) analysis and inferences made from interview transcripts are well justified in literature and policy documents. Saturation point was acknowledged when no new information was derived from interviews with experts and pedestrians. Afterwards, data triangulation ensured that the identified indicators (see 3.3.3) are based on biases and confirmed by other method as mentioned. This produces a comprehensive analysis of the specific methods.

CHAPTER 4

CASE AND CONTEXT DESCRIPTION

Source:
https://upload.wikimedia.org/wikipedia/commons/2/24/Accra_Central%2C_Accra%2C_Ghana.jpg

4.0 CASE AND CONTEXT DESCRIPTION

This chapter discusses the selected case and its importance in exploring walkability and mobility wellbeing in Accra, Ghana. It tackles a case of the Accra Central Business District (CBD) area for properly exploring the research objective. In this chapter, I look at the

i) The general description of the Accra CBD area
ii) An overview of walking in Accra; Accra Stay by Plan
iii) An overview of transport planning for pedestrians in Accra Metropolitan Assembly (AMA)

4.1 Accra Central Business District (CBD) area

This study is undertaken in Accra, the capital city of Ghana in West Africa. The city has a population of about a 2.6million (*Population Stat*, n.d.). This study focuses on walkability and perceived mobility wellbeing in Accra. It zooms in on the CBD area as the case study.

The CBD area lies within the Accra Metropolitan Assembly (AMA). It is bordered by the Ring Road, which runs over 18km long with connecting highways to other parts of the city and administrative regions. It has an arbitrary boundary of 5.88sq km. This area is interesting for this research because it is the most concentrated area in Accra, with routes that house key corridors with high traffic congestion and immense commercial activities (*Figure 9*). As the CBD, it is a central transportation hub for various Ghanaian dwellers and travellers, encouraging access-driven pedestrian activities. Important places in the CBD are the headquarters and offices of ministries and huge corporations as well as three big markets; Agbogbloshie, Kaneshie (Figure 8) and Makola (see Figure 9).

The CBD is characterised by mixed land uses (see *Figure 10*) consisting of residential, commercial, industrial, and so on, providing primary to tertiary services within and beyond the metropolis. This is also attributed to the high motorisation and commercialisation with intense congestion. As the CBD encourages various land uses, it also has different kinds of road classes. From the broader urban, feeder and trunk roads in Ghana, we classify the roads in the CBD area by the functions they provide. Thus, three classes of roads exist – primary, secondary, and other roads (see *Appendix 6*). Pedestrian interaction on the road is explored to understand the walkability.

Figure 8 *Kaneshie market, Accra, Ghana*

(Source: https://www.wbcsd.org/Overview/News-Insights/Insider-perspective/Insider-Perspective-Africa-Climate-Week. Accessed on 27/06/2022 11:23)

Figure 9 Makola Market

(Source: Business Desk, 2017)

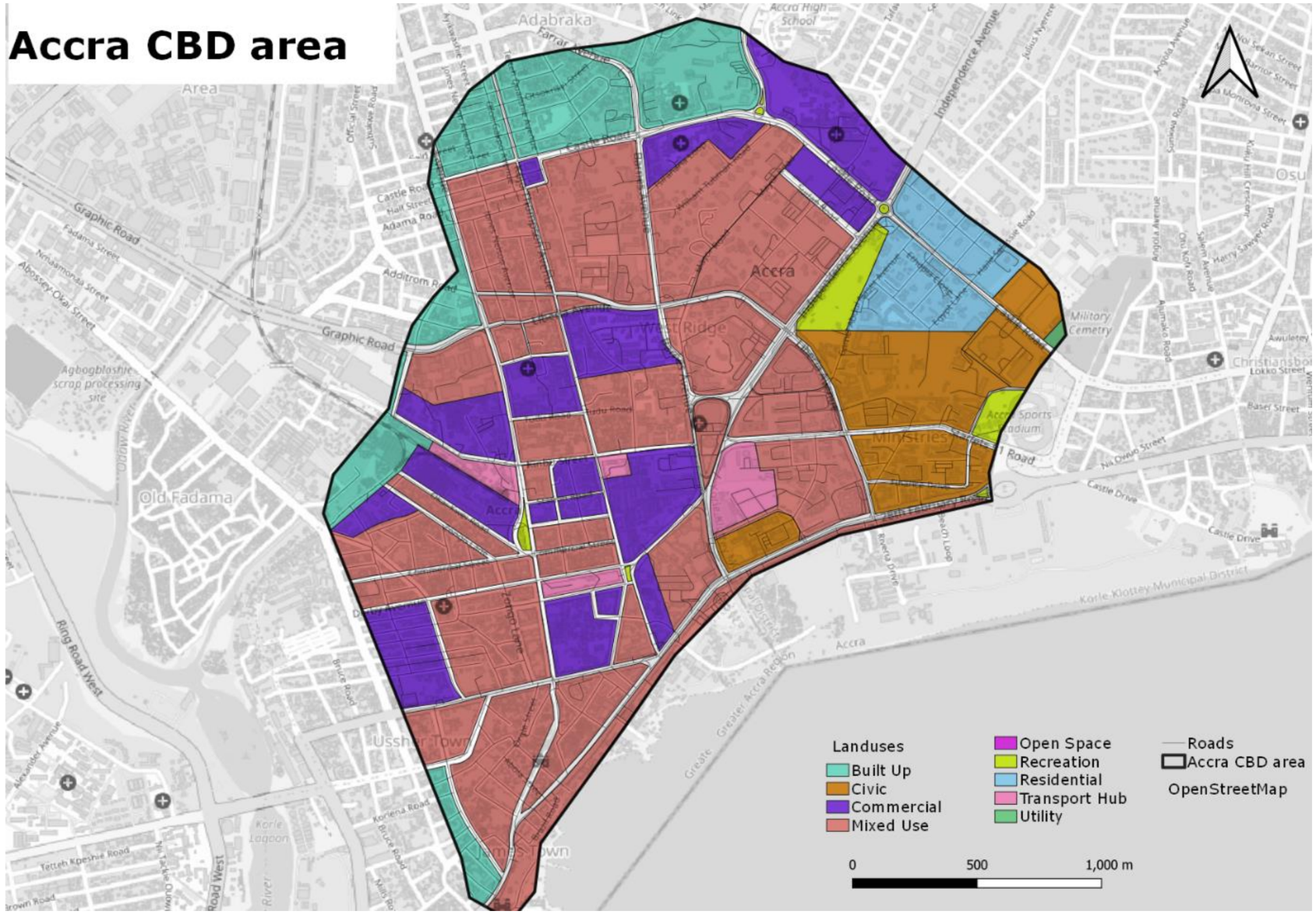


Figure 10 Accra CBD area showing various land uses

4.2 Accra Stay by Plan: On walking in Accra

Walking forms about 32.8% of the mode of transport to and from the workplace and other origins (AMA, 2017). Accra Stay by Plan is a very popular adage used in the city. Facetiously, inhabitants use it to mean that with the city's vigorous activities (rapid urbanisation) and general nature of intense commercial activities, it is best always to have a strategy or a plan B at least. This applies to moving from one point to another, looking out for yourself on the street and being smart at it. It greatly applies to the heavy traffic in the city. Coupled with hawkers and the recent rise of illegal tricycle riders who have become a constant nuisance to all other road users (Quayson, 2014). So, if one does not plan on where to move from and where to end the journey, one will spend the entire day in an uber or trotros. For a pedestrian, you ought to be extremely vigilant with your property and your personal safety for the competition with petty traders, hawkers, cars, motors, and tricycles. It will be unfortunate for a pedestrian to knock down a tomato seller's neatly arranged 'tomatoes' unless you are ready to buy a whole drum of tomatoes. Given that the pedestrian walkways have conveniently become markets for these petty traders (Amoako et al., 2014). So then, when walking in Accra, *you can't pass here unless you have a strategy!*

4.3 Transport planning for pedestrians in Accra Metropolitan Assembly (AMA)

As indicated above, the city Accra is under the Accra Metropolitan Assembly. The planning system of Ghana is decentralised, with policies and plans coming from the National level, and implemented at the local level – Metropolitan, Municipal District Assemblies (MMDAs). The central government provides the plans and policies through the Ministry of Transport.

The Ministry of Transport was recently commissioned with three subdivisions: Ministry of Roads and Highways, Ministry of Railways Development and Ministry of Aviation. Under the Ministry of Roads and Highways are the three main sectors/departments: the Ghana Highway Authority (GHA), the Department of Feeder Roads (DFR), and the Department of Urban Roads (DUR). Apart from these, other departments like the National Road Safety Authorities (NRSA) and Transport Planning office in the Metropolitan, Municipal and District Assembly (MMDAs) (see *Figure 11*) at the local assembly play a role in providing a body of decisions towards pedestrian planning in the metropolis (National Transport Policy, 2008, 2020). The MMDAs, where the Accra Metropolitan Assembly falls under, has sub-departments that regulate and implement district (metropolitan) level projects and plans and land use.

For urban mobility, all transport-related policies are drawn from the National Transport Policy (NTP). The current NTP in use was approved and published in August 2020, after the last one in 2008, which was the first-ever comprehensive policy document (*Ghana.GOV*, n.d.). The national government draws out the document with a review of the current past policy document of 2008 with a series of workshops with delegates from the various ministries and agencies. So far, there is not yet a specified period for the update of these policy documents.

The NTP is a framework that embodies a set of guidelines with goals and strategies for the transport sector in Ghana. "*The policy is designed to help reduce transport costs for internal distribution of goods and services as well as keeping the nation's exports competitive in the world market*" (National Transport Policy, 2020). This framework is delivered through the Ministry of Local Government and Rural Development (MLGRD) through to the MMDAs, which its sub-departments and agencies (see *Figure 11* below)

In essence, the NTP identified three main goals to be related (somewhat) to pedestrian accessibility and planning. *Goal 4.2.1 Create an accessible, affordable, reliable, safe and secure transport system for users accessible, affordable, reliable, safe and secure transport system for users (*see table below). With this goal, one objective identified to target NMT, which pedestrian is considered here specifically. The objective seeks to "*Integrate non-motorised transport facilities in all transport infrastructure developments"* (National Transport Policy, 2020) The objective also has two strategies that is; 1) *provide dedicated safe, reliable, and appropriate facilities for NMT users across all transport modes and 2) maintain and free-up existing NMT facilities from encroachment.*

Though nicely drawn up system in *Figure 11*, there is still an issue of undefined roles and execution of plans and policies. The implementation of policies is sometimes done at the local level and other times at the national level. This way when the local level develops independent project. This dynamic is not clearly defined. For instance, the Pedestrian Action Plan(AMA, 2017), The Accra Resilience Strategy (Accra Metropolitan Assembly, 2019), the Policies for Sustainable Accessibility and Mobility in Urban Areas of Ghana (Stucki, 2020) ministry do not recognise them at the national level, nor outcomes incorporated in the national policy documents. Though some of these documents are outdated, there are no published evaluations or outcomes to be assessed, which leaves room for doubt about such documents.

Figure 11 Decentralised Government for urban mobility in Ghana
Source: Stucki (2020)

CHAPTER 5
FINDINGS

Source: https://ama.gov.gh/index.php

5.0 FINDINGS

This chapter reports the findings on walkability conditions in the walking environment in Accra. It highlights the relevant results according to the SRQs developed for the research. The findings are tied to the main conceptual framework (see 2.4), hence detailed in three main blocks

i) the performance of the walking environment
ii) the quality of walkability in Accra
iii) the perception of mobility wellbeing

5.1 The performance of the walking environment (media, spatial and composite analysis)

To identify and provide insight into the current spatial and non-spatial conditions and planning processes of the walking environment in the Accra CBD area, the researcher assessed media documents in the form of texts (see 3.2.3). The following conditions and indicators were identified (see Table 3 below). The table below shows the spatial and non-spatial conditions and the indicators identified from preliminary studies (see *Appendix 5*). However, the non-spatial conditions (safety and liveability) were put on hold from this phase onwards for a later discussion. The final walkability conditions assessed in this phase for the performance of the walking environment were connectivity of path, (physical) quality of path, flow capacity and continuity (*see Table 3*), classified as spatial conditions. On the table, where indicators best suit the conditions, they are marked as *x*. In the subsequent sections, each condition is tackled with the corresponding indicators.

See Appendix 6 for indicator maps

Table 3 Walkability indicators with spatial and non-spatial and conditions

s/n	**Conditions** Indicators	Connectivity of path	Quality of path	Flow capacity of path	Continuity of path	Safety of path	Livability of path
1	Pedestrian facility	x		x	x	x	
	Condition (physical) of the path[4]		x				
2	Path materials		x		x		
3	Path obstructions			x	x		
4	Path completeness				x		
5	Crosswalks with conditions	x		x		x	
	Crossing aids[5]					x	
6	Traffic control			x			
7	Speed Limit			x			
8	Street parking			x			
9	Building					x	x
10	Lighting		x	x		x	x
11	Amenities	x					
12	Shade trees		x				x
13	Green spaces		x				
14	Informal markets		x	x			
15	Cleanliness and maintenance		x				x

Source: Author's construct, derived from media and literature documents

[4] Is an attribute of *Pedestrian facility*.

[5] Is an attribute of *Crosswalks with condition*.

Connectivity of path

The walking environment is defined by the connectivity it provides. Connectivity here refers to how the road segment connects with other routes and access infrastructures or facilities such as crosswalks, traffic controls and transportation hubs. Indicators observed for connectivity were pedestrian facility (1), crosswalks (5), amenities (11), and elements that ensure the connectivity traffic controls (6) and crossings (5) (see *Table 3*). The basic indicator here is the pedestrian facility, be it walkways, sidewalks or footpath; however, it is defined. Connecting the path begins with having and defining where the pedestrian walks.

From media conversations, it was discovered that major roads with high-speed limits provide little access for pedestrians. People are concerned about the idea of walking long enough to be able to get to the nearest crossing facility. This was noted from media conversations as

> "…*some pedestrian bridges are usually far apart, and most pedestrians will not voluntarily accept the added inconvenience of walking ten or twenty minutes out of their way just to get to a pedestrian bridge, and instead will dash across the Highway at the nearest convenient location*" (DA012).

See the following examples of situations that imply good, fair and bad path connectivity.

As indicated earlier, the pedestrian facility (1) provides a base for all other assessments of the performance of the walking environment. It gives an impression of how easily connected a path is for the movement of the pedestrian. Therefore, the presence of this indicator suggests a positive performance in the walking environment. Similarly, crosswalks (5) indicate the positive performance of pedestrian facility is juxtaposed with crosswalks in the CBD area it shows how the area is performing in terms of providing access for pedestrians (see *Figure 15* below). On the map as shown in *Figure 15*, the presence of pedestrian facilities is seen as green lines and crosswalks as green dots because they give a positive indication of connected paths for pedestrians by linking paths through crosswalks (*see Figure 12* below). On the map (*Figure 15*), very few areas in the CBD area are well connected as indicated in *Figure 14* or green, for that matter. There are more streets with few to no pedestrian facilities, such as walkways and crossings in the CBD area, for the red areas depict such situations as shown in *Figure 14*. In essence, they reduce the performance of the walking environment as there is an absence of pedestrian facilities and crosswalks. This occurrence may support walking to some extent but reduces the connectivity of the pedestrian path, reducing the performance.

Figure 12 Example of good connectivity of path

Here there is a crosswalk, lowered curb to connect walkways on both sides. Independence Ave, Accra, Ghana. (Source: Google Maps via Street view (2016) [Accessed on 16/06/2022 12:14])

Figure 13 Example of fair connectivity of path

Here there is a traffic light with faded road marks and high curb connecting both sides of the main carriage. Bishop Lamaire Lake, Accra, Ghana. (Source: Google Maps via Street view (2016) [Accessed on 12/04/2022 19:00])

Figure 14 Example of bad connectivity of path

Here there is no traffic light with faded to no road marks and high curb connecting both sides of the main carriage. Prof. Atta Mills High St. (Source: Google Maps via Street view (2016) [Accessed on 13/04/2022]

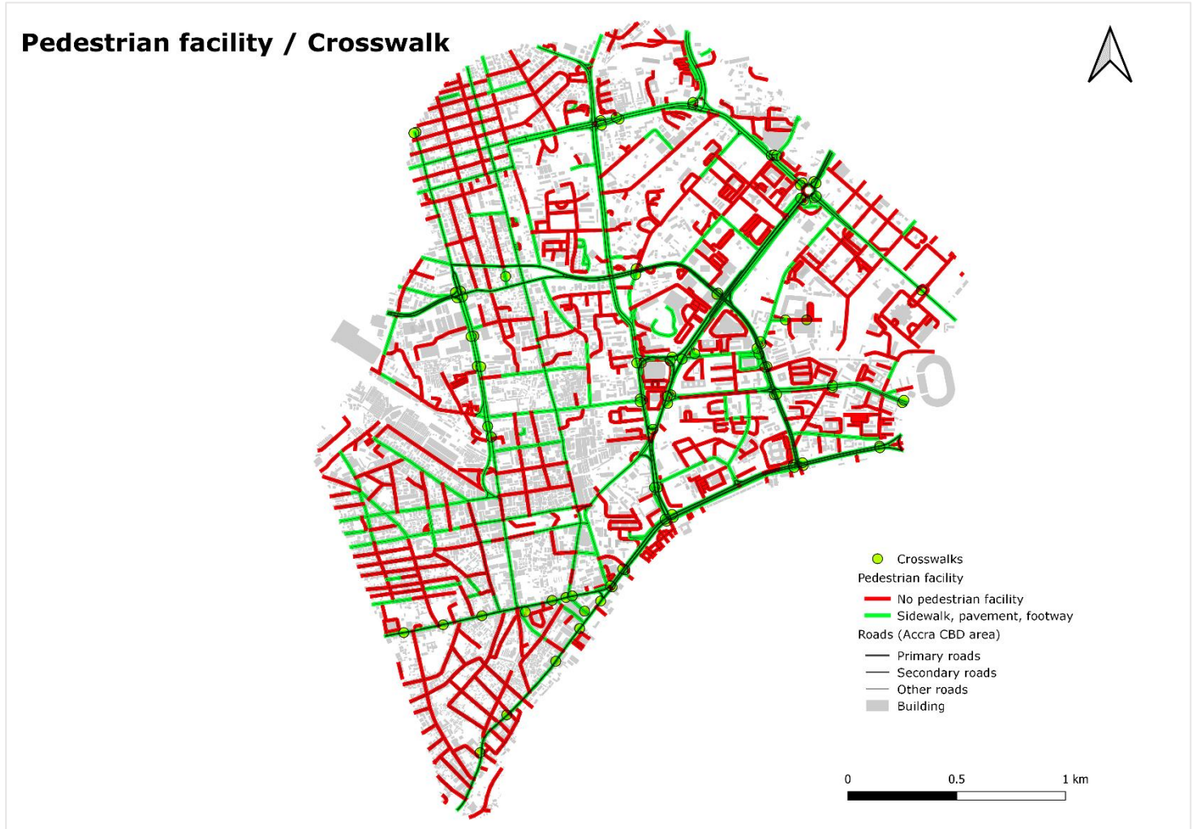


Figure 15 Connectivity of path showing pedestrian facility (1) and Crosswalk (5)

See Appendix 6 for larger map

Quality of path

Path quality refers to the walking environment's physical attributes. This could be the pedestrian walkway, footpath or way, and steps. It is observed to be one of the conditions mostly referred to with numerous indicators (see *Table 3*). From literature, it was observed that the available path materials, the physical condition of the path, the buffer distance between pedestrians and vehicles, lighting (streetlights), amenities, shade trees and green spaces, informal markets and cleanliness and maintenance of path could determine this condition. In contrast, the presence of some of these indicators meant positive implications for walking and vice versa. It is the opposite for these indicators; informal markets and the condition (physical) of the path. The presence of these indicators implies a negative implication for walking.

See the following examples (Figures 16, 17 and 18) of situations that imply good, fair, and bad path quality.

In the path quality discourse, pedestrian walkways have been referred to as 'death traps' as recorded from media analysis. *"A number of pedestrian walkways in parts of the capital have become death traps. Numerous underground chambers or manholes constructed as conduits for sewerage and cables have all been exposed…"* (DA01). This results from an online reportage by a national broadcasting corporation in Ghana. It appears that the nature of pedestrian walkways is not so pleasant (see *Figure 18*). This is attributed to the cleanliness of most routes people ply in the CBD area. Cleanliness, as a positive indicator of the quality of the path (see Appendix 6), shows that when present (clean path), it increases the performance of the path (see *Figure 17*). From media conversations, some people see the walking environment in Accra as a haven for dirt, describing it as "*empty Coconut shells are Accra's new favourite litter item and pedestrian walkway are the new dump site [….]. It's nasty.*"

The map below (*Figure 19*) puts together the following indicators for the quality of path (see *Table 1*); path materials (2), path cleanliness (15), informal markets (14), shade trees (12) and green spaces (13). There are more not clean paths than clean ones, as shown by the red areas. At the same time, it can be noticed that areas that are not clean have the most informal markets, as shown by the intensity (red) of the heat map below. Informal market activities in the CBD area are in the strategic southern part of the area where most major roads meet. As the activities grow, so do interactions which may contribute to the physical quality of the environment. Although the activities may attract pedestrians for commercial purposes, the outcome of it, such as dirt is likely to reduce the physical quality to attract pedestrians.

Figure 16 Example of fair quality of path

Here there are two large sized holes on a concrete sidewalk with connected crosswalk. Kwame Nkrumah Avenue, Accra, Ghana. (Source: Google Maps via Street view (2016) [Accessed on 17/04/2022 18:08])

Figure 17 Example of good quality of path

Here there is a paved sidewalk, with greenery both sides of the main carriage., with connected crosswalk. There is a metal barricade ahead separating sidewalk from carriage way. Liberia Rd (Source: Google Maps via Street view (2016). [Accessed on 09/05/2022 17:48])

Figure 18 Example of bad quality of path

Here there is an unpaved, deteriorated narrow path with no pedestrian separation. There is no lighting and informal markets. Okai Nettey Rd, Accra, Ghana. (Source: Google Maps via Street view (2016). [Accessed on 09/05/2022 17:29])

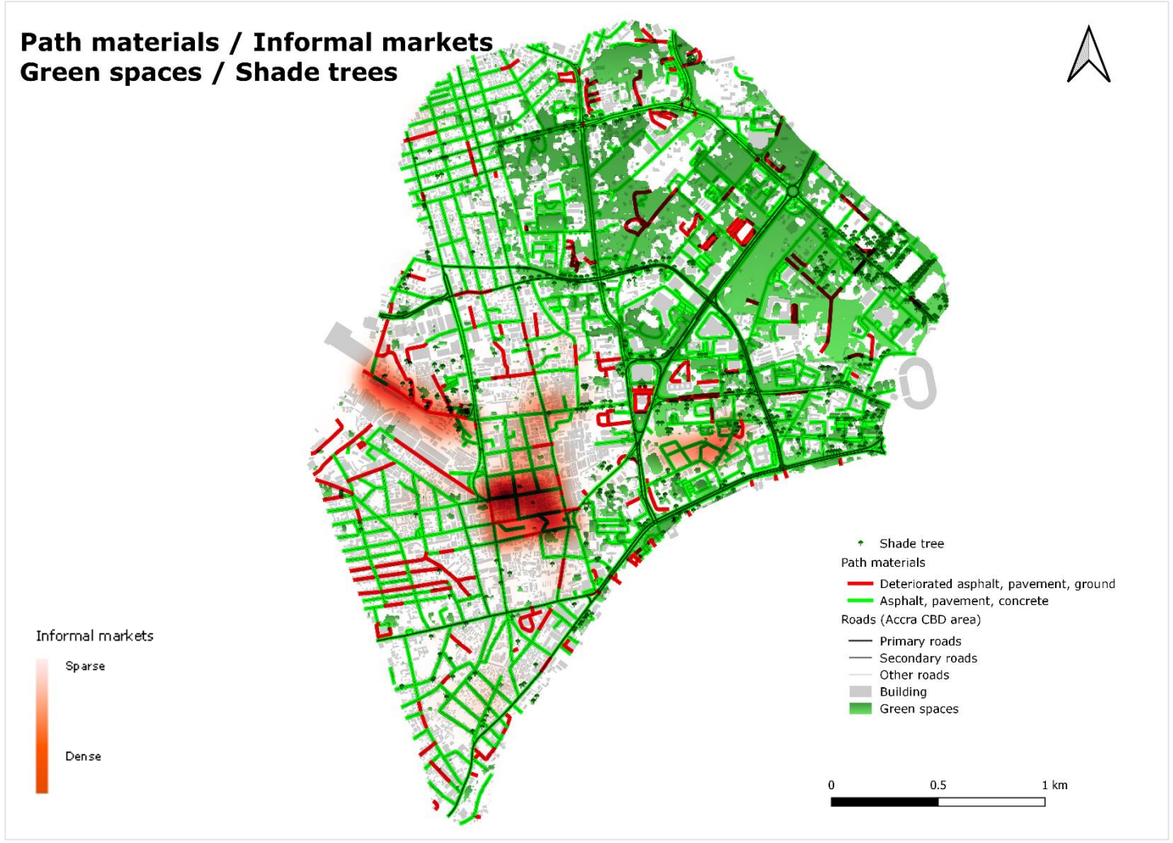


Figure 19 Quality of path showing path materials (2), informal markets (14), green spaces (13) and shade trees (12)

See Appendix 6 for larger map

Flow capacity of path

The flow capacity of a path is described by the opportunities the walking environment provides to accommodate pedestrians at a time without bumping heads. Pedestrians can freely move in whatever directions suitable to them, thus providing "sufficient space for normal walking speeds…." (Lo, 2009). This walkability condition was characterised by the presence or absence of indicators like pedestrian facility, path obstructions, traffic control, speed limits, street parking, and informal markets. These indicators are things that would one or the other impede the smooth movement of pedestrians from one point to another in the walking environment.

See the following examples of a situation that imply good, fair and bad flow capacity of the path.

The heatmap below (*Figure 23*) shows the performance of the CBD area according to pedestrian facilities (1) and informal markets (14), and street parking (8). As a good indicator of a path's positive performance, pedestrian facilities show where the pedestrian could go. However, as the presence of informal markets increases on pedestrian paths, it negatively influences the flow of capacity of the environment as shown in Figure 23. From spatial analysis, it was gathered that the CBD area has more informal activities present in the southwestern parts (see *Figure 22*). Pedestrians may find informal markets both appealing (convenient) and a barrier. Consequently, their presence reduces performance while also enticing people to walk.

Similarly, residents reckon in social media conversations that "*…hawkers are quick to take over parking stations, parking lots, pedestrian crossings and even encroach on the streets this forcing vehicles to share space with the public.*" (DA09). While on the subject, it appears that not only hawkers and other informal commerce contribute to the path obstructions (see *Appendix 6*) that are present in the Accra CBD area (see *Figure 23* below)

From the map as shown in *Figure 23*, it is seen that the market activities are spatially located along with pedestrian facilities where activities are intense. Then they pose as obstructions to the easy flow of pedestrians. Thus, the more a path is occupied by informal markets, the less likely easy pedestrian flow. This is similar to street parking (Indicator 8). As a negative indicator, its presence is no-good for pedestrian flow (see *Figure 22*) as it reduces the available space for walking if there are no demarcated pedestrian facilities. Thus, reducing the performance of the walking environment as the red areas keep increasing in the map as shown in (*Figure 23*).

Figure 20 Example of good flow capacity of path

Here there is a large, paved walkway well separated from carriageway on both sides. Prof. Atta Mills High St, Accra, Ghana. (Source: Google Maps via Street view (2016) [Accessed on 04/04/2022 09:56])

Figure 21 Example of fair flow capacity of path

Here there is a narrow, paved walkway on one side of a single carriageway. Tetteh Quarshie, Accra, Ghana. (Source: Google Maps via Street view (2016) [Accessed on 12/04/2022 15:40])

Figure 22 Example of bad flow capacity of path

Here the street looks big enough to accommodate both pedestrians and vehicles, however it has been taken over by hawkers and informal markets reducing available space for users of the road. Kwame Nkrumah Ave, Accra, Ghana. (Source: Google Maps via Street view (2016) [Accessed on 20/03/2022 14:11])

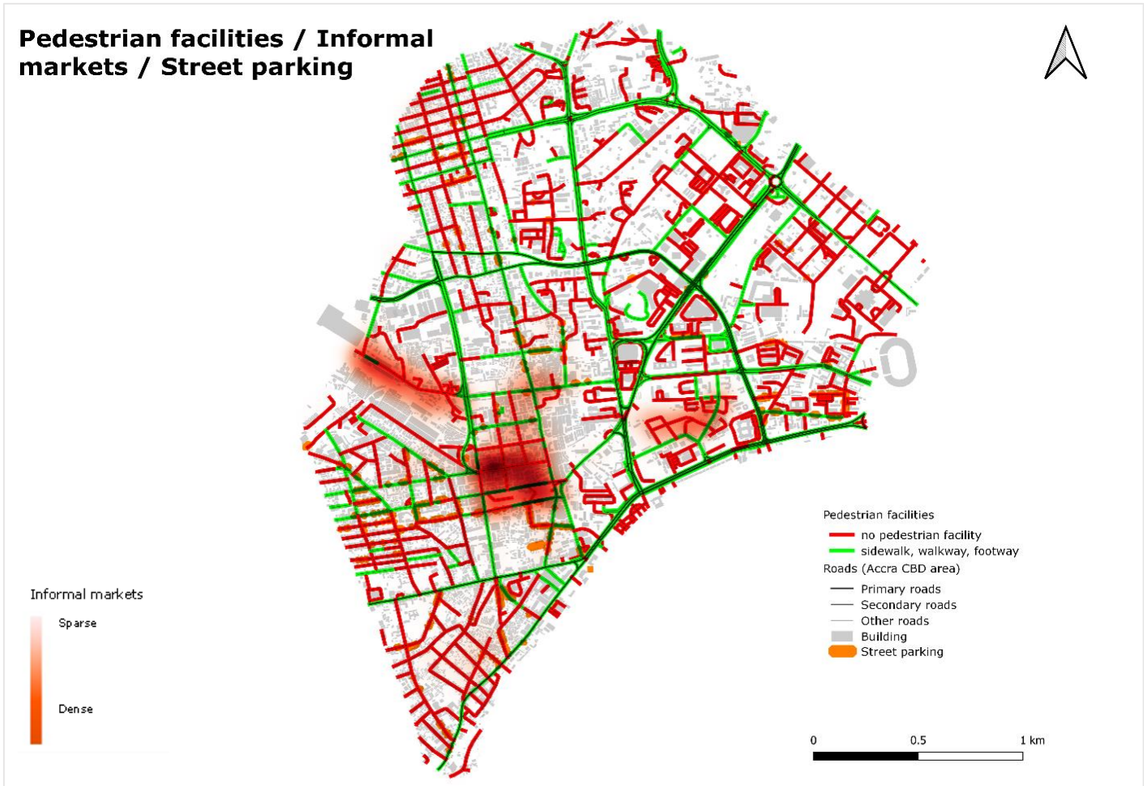


Figure 23 Flow capacity of path showing pedestrian facilities (1), informal markets (14) and street parking (8)

See Appendix 6 for larger map

Continuity of path

Path continuity is identified as the ability of the walking environment to cater to conditions such as pedestrian facility, path completeness, the condition of the path (materials) to ensure through-movement through a path and the obstruction on the path (see *Table 3*). The continuity of a path can be hindered by obstructions such as informal markets and street parking, as shown in the map below. However, interestingly, when obstructions disrupt a pedestrian's journey on a path, they are forced to move onto the carriageway. The problem here would be if the carriageway provides the same comfort and convenience to the pedestrian, hence considering the path materials (see Figure 26).

See the following examples of a situation that imply good, fair and bad continuity of path.

As shown the map in *Figure 26* above, it is seen that there are many instances where the pedestrian's path is discontinued, evidently, in the southern path of the CBD where more commercial activities have a lot of conditions that cause a discontinuity of pedestrian path (see *Figure 25*). This area has high intensity of path obstructions, as indicated by the heat map, street parking activities and not so many crosswalks to indicate right of way. Where crosswalks directly link pedestrian from their path to the next end, it shows a good continuity of pedestrian path (see *Figure 24*). Also, this part of the CBD appears to have several deteriorated paths (asphalts, concrete, pavements or ground/dirt) that are likely to reduce the continuity of a pedestrian journey.

Figure 24 Example of good continuity of path

Here there is a well barricaded paved walkway on both sides of carriageway with crossing to through to all ends of the street. Crossing is indicated by road markings and pelican signals. Independence link, Accra, Ghana. (Source: Google Maps via Street view (2016) [Accessed on 07/04/2022 11:19])

Having seen the individual walking conditions and the spatial representation in the CBD area, we zoom out the focus. In the next phase (see 5.1.1), I put all the conditions together with all indicators to give the collective performance of the walking environment in the Accra CBD area.

Figure 25 Example of fair continuity of path

Here there is a paved walkway however the path is obstructed by constructions works causing pedestrians to walk on the carriageway. Kojo Thompson Rd, Accra, Ghana. (Source: Google Maps via Street view (2016) [Accessed on 18/06/2022 18:52])

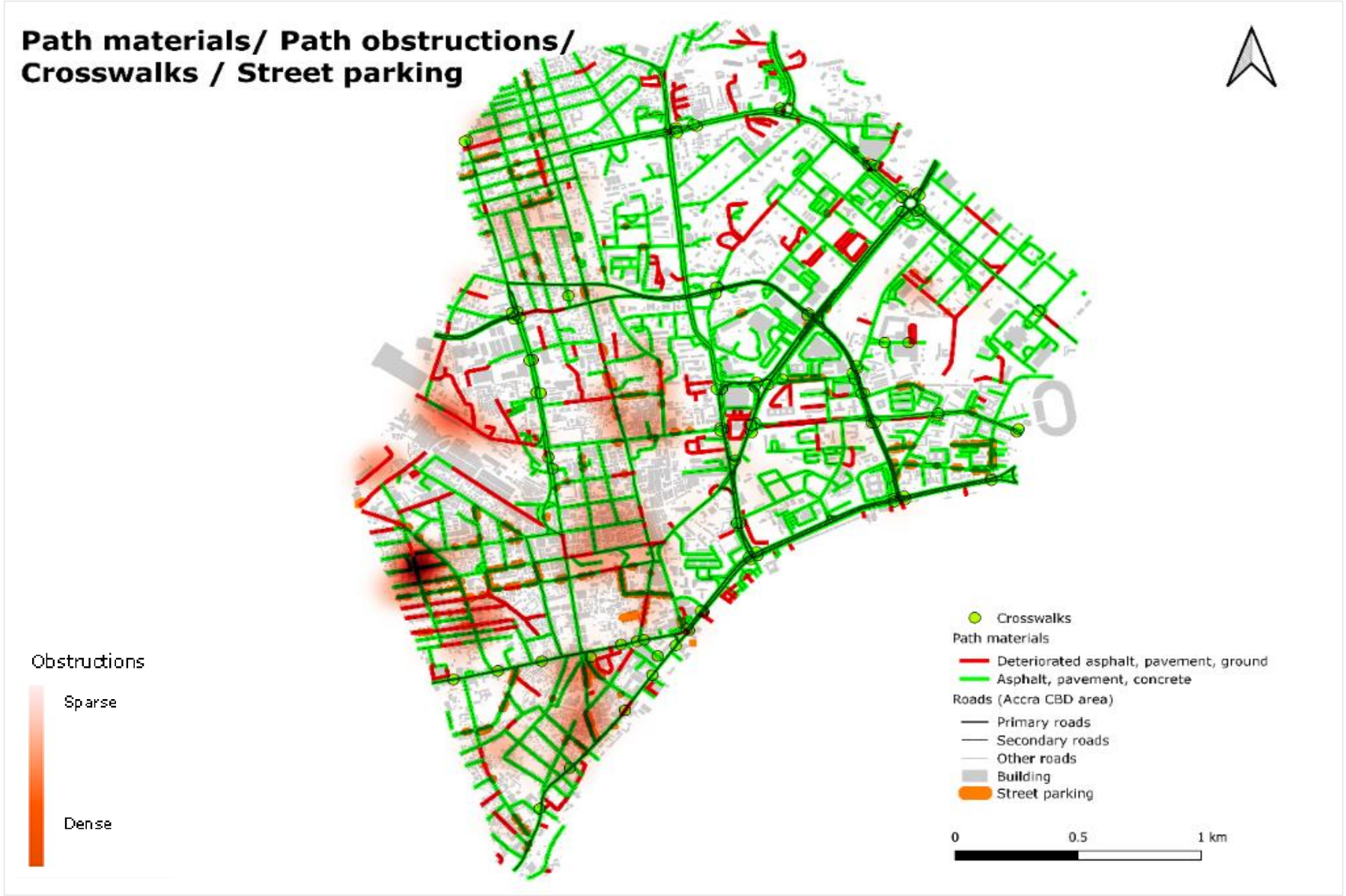


Figure 26 Continuity of path showing path materials (2), path obstructions (3), crosswalks (5) and street parking (8)

5.1.1 Resulting Composite Walkability Index (CWI)

The results in the previous section give an idea of the conditions present in the walking environment. These conditions are needed to be certain on the performance walking environment to determine the overall walkability of Accra. To do this, the aggregated score for all indicators mentioned above (see *Table 3*) is necessary to assess the performance of the entire environment in the CBD area.

The performance of the walking environment was determined by the presence of 15 indicators (see *Table 3*) influencing walkability. It was determined by the presence or absence of indicators in a particular road (buffered) segment. Thus, the CWI is the aggregated measure of performance of the walking environment. The spatial representation of the performance of the walking environment is shown in *Figure 28* below.

From the analysis, the indexes were grouped into five classes at equal intervals. The minimum score was -2.29072 with a maximum of *6.97348* and a mean of *0.642698* as derived from Sum Statistics via QGIS. Invariably, the index implies that the lower the score, the lesser the performance, thus less walkable. Inversely, the higher the value, the higher the performance of the walking environment, thus making it more walkable. Below is (Table 4) showing the index values or walkability according to classifications, and interpretations.

As depicted in earlier paragraphs, the researcher has been able to draw out the specific indicators that result in conditions in the walking environment that are likely to reduce or increase its performance. The composite measure of the indicators shows an aggregated normalised understanding of the walking condition in the walking environment of the Accra CBD area.

Unfortunately, as observed from the composite Figure 27, there appears to very few segments with walkable -most walkable routes. This generally implies that there the walking environment in Accra CBD area is less performing to encourage pedestrian.

After measuring and understanding the conditions in the walking environment, we can now explore the planning processes to determine to what extent they cover the conditions in the walking environment. An assessment of the planning helped gather insight on what could possibly contribute to the performance of the condition in the walking environment.

See impressions of each classification range below.

Table 4 Composite walkability index CWI with values, classification, and interpretations

Value (Index)	***Classification***	***Interpretation***
-2.23 – -0.4	Least walkable	It is least performing; least walkable. The negative value is because of the presence of a pseudo indicator
-0.4 – 1.4	Less walkable	It is less performing; less walkable. It has not more than one (<25%) indicators present.
1.4 – 3.3	Walkable	It performs fairly; it is walkable. The performance is high. It has more than one (<50%) indicators present
3.3 – 5.1	More walkable	It is more performing; it is more walkable. The performance is higher. It has more than one (>50%) indicators present
5.1 – 7	Most walkable	It is most walkable. The performance is highest. It has almost all (>75%) conditions present

Source: Author's construct

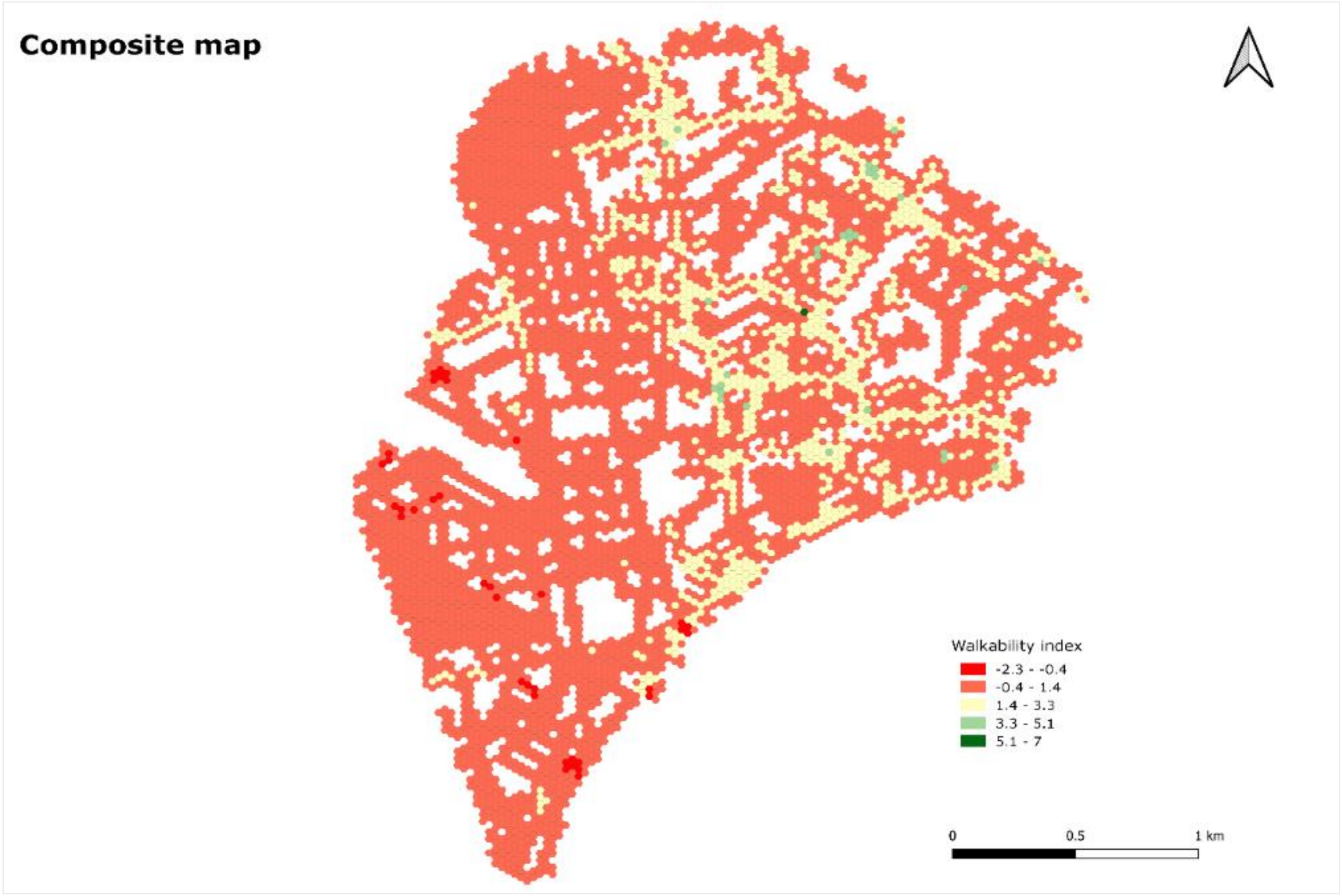


Figure 27 Composite map representing walkability index of Accra CBD area

Range: -2.23 – -0.4 | Least walkable

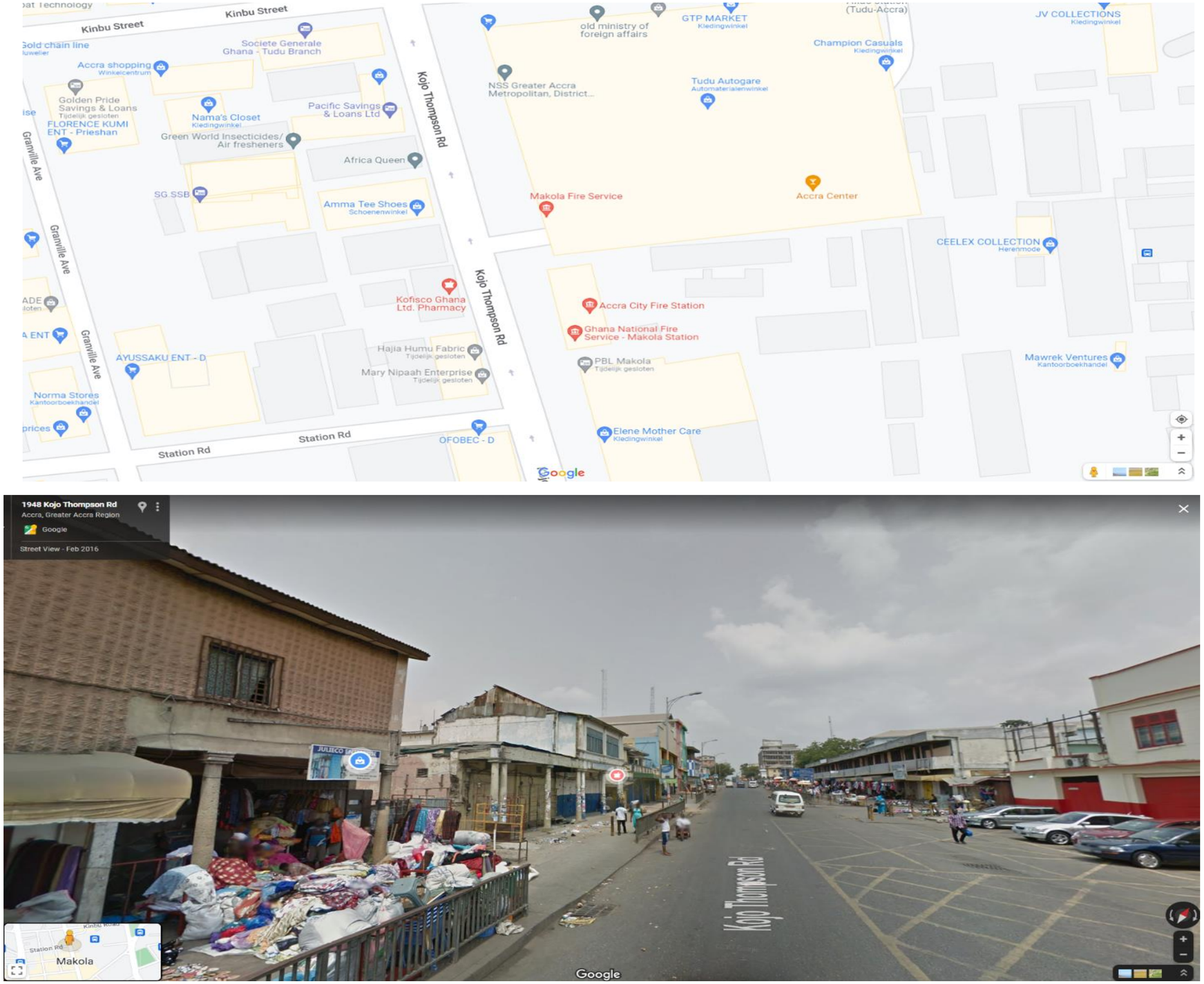


Figure 28 Kojo Thompson Rd, Accra, Ghana

Source: Google Maps via Street view (2016) [Accessed on 08/04/2022 17:53])

Range: -0.4 – 1.4 | Less walkable

Figure 29 Agbogbloshie Rd, Accra, Ghana

Source: Google Maps via Street view (2016) [Accessed on 04/05/2022 18:43])

Range: 1.4 – 3.3 | Walkable

Figure 30 Starlets Rd, Accra, Ghana

Source: Google Maps via Street view (2016) [Accessed on 08/04/2022 17:53])

Range: 3.3 – 5.1 | More walkable

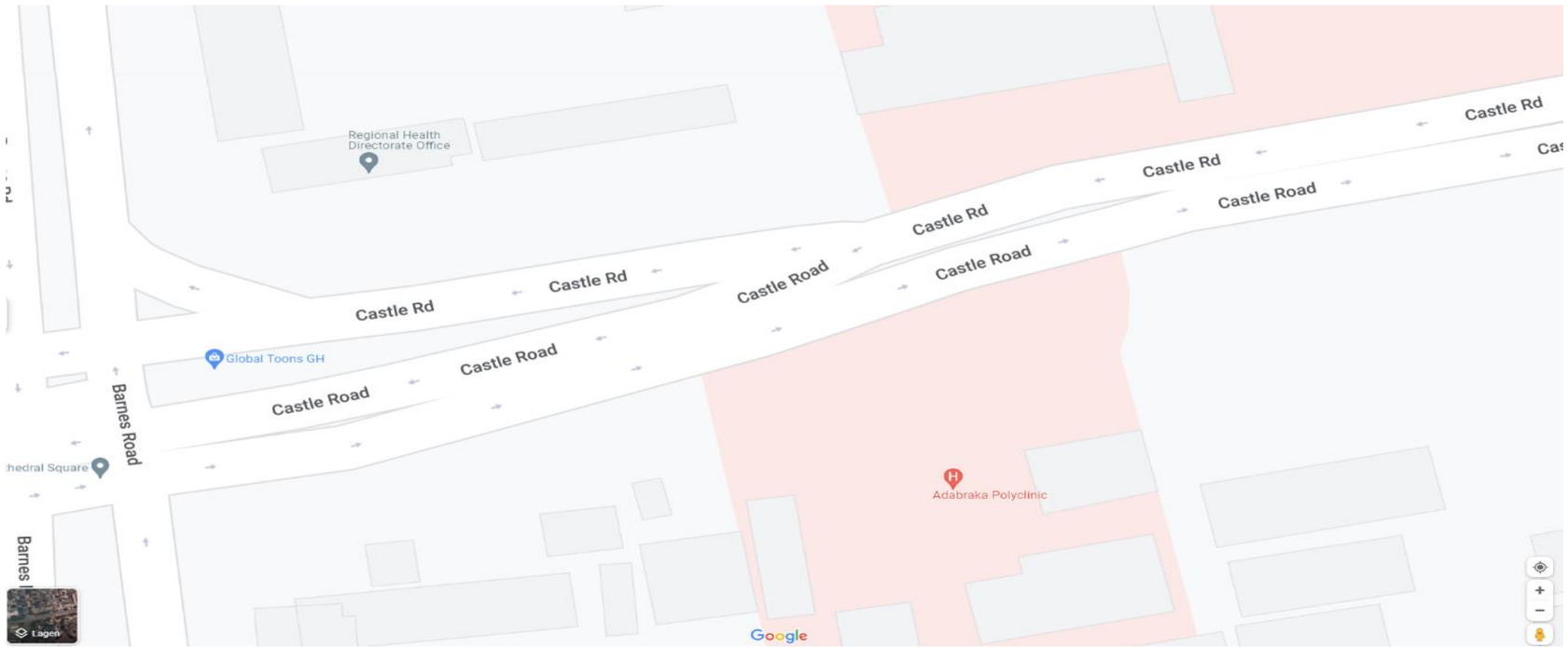


Figure 31 Castle Rd, Accra, Ghana

Source: Google Maps via Street view (2016) [Accessed on 14/06/2022 21:37])

Range: 5.1 – 7 | Most walkable

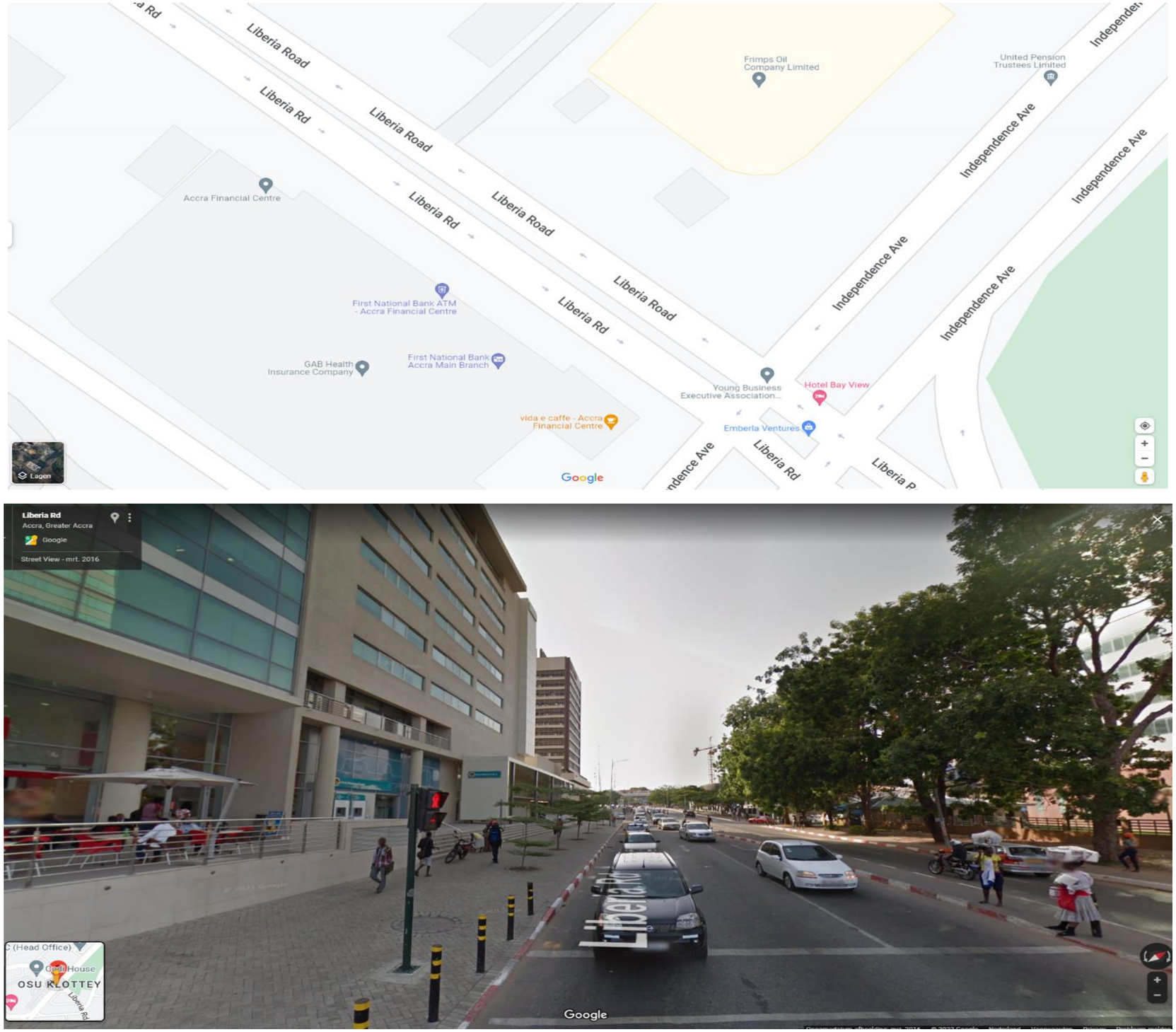


Figure 32 Liberia Rd, Accra, Ghana

Source: Google Maps via Street view (2016) [Accessed on 14/06/2022 21:25])

5.1.2 Pedestrian planning process in Accra Metropolitan Assembly, Ghana (policy documents, expert interviews)

The pedestrian planning is done at the metropolitan level (MMDA, see 4.3) by the Accra Metropolitan Assembly. This can be found in a series of key documents, such as the National Transport Policy (2020) that the researcher studied. As indicated in (4.3), the planning process is the top-bottom, with execution fragmented at the bottom. There is almost little evidence of the involvement of other bodies such as private corporations and agencies in the planning. Though the documents reference consultations with NGOs, the approach seems rather archaic to inform any realistic involvement and contributions. Below is an overview of some goals relevant to non-motorised transport where pedestrian planning can be established. The tables present goals according to their objectives, strategies and level of operation (see 3.3.4)

Table 5 Goal 4.2.1 Create an accessible, affordable, reliable, safe and secure transport system for users

	Objective		**Strategy**	**Level of operation (LOP)**
4.2.1.1	*Ensure systematic development of all modes of transport for efficient and effective modal choice in all regions of Ghana*			
		1	*Systematically upgrade all modes of transport to better serve the public*	Generic
4.2.1.2	*Develop and implement effective maintenance system for all transport modes*			
		4	*Build capacity to ensure requisite skills for transport infrastructure maintenance*	Generic
4.2.1.3	*Ensure safety and security through all the stages of transport development and operations*			
		1	*Incorporate health & safety standards in planning, design, construction, operations, and maintenance for all modes*	Generic
		3	*Amend the law to empower National Road Safety Commission (NRSC)*	Generic
4.2.1.4	*Integrate non-motorised transport facilities in all transport infrastructure developments*			
		1	*Provide dedicated safe, reliable, and appropriate facilities for NMT users across all transport modes*	Specific
		2	*Maintain and free-up existing NMT facilities from encroachment*	Specific

Source: Author's construct based on National Transport Policy, Ghana (2020)

Table 6 Goal 4.2.3 Provide transport infrastructure and services without compromising the integrity of society, environment, health, and the climate

	Objective		**Strategy**	**Level of operation (LOP)**
4.2.3.1	*Subject all Transport infrastructure projects to safety, environment, social and health impact assessments, and audit at all stages of development and operations of the transport system*			
		1	*Ensure that Strategic Environmental Assessment (SEA) processes are applied to all transport sector policies, plans and programmes*	*Generic*
		2	*All transport infrastructure designs shall be subjected to safety, environmental health audit to ensure provision of appropriate mitigation measures to address epidemic and pandemic effects*	*Generic*

Source: Author's construct based on National Transport Policy, Ghana (2020)

Table 7 Goal 4.2.4 Improve scheme designs and make them "bankable" and demand driven

	Objective		**Strategy**	**Level of operation (LOP)**
4.2.4.2	*Create an enabling environment for public and private sector participation in transport infrastructure development and service provision*			
		1	Carry out consultation with users in the process of planning transport infrastructure and services	Generic

Source: Author's construct based on National Transport Policy, Ghana (2020)

The objectives with strategies show how policy makers and decision-makers tackle pedestrian situations in the national jurisdiction emulated through the metropolis. As it stances, it gives superficial reasons to assess the performance of the walking environment. One major finding that was identified was that the 'pedestrian planning' is not clearly stipulated in policy documents and plans of the assembly or national documents. As it stands, no one document clearly indicates what goes into considering the pedestrian and NMT in Accra. This finding also resonated with what one expert reacted to as;

> *"At the assembly level we haven't paid much attention to, and even as you said, in policy documents, when you go online you won't see much. You know, you only see what you have mentioned. So I think it's a wake up call."* (EXP02)

It appears that the documents that mention pedestrians or any other NMT consider it as a secondary matter. Another expert stated that,

> *"We don't really concentrate on NMT's in Ghana as far as and even with public transports, our engineers unfortunately do not really put much emphasis on it. Most of the designs that is done in our parts of the in our country is basically concerned with making cars movable. We're not looking at moving people, but rather moving cars. When we see there is a stretch of road and there is congestion there, the first thing that comes to mind is let's expand the road. Or let's build another road so that's more cars can move, but that is actually the wrong way."* (EXP04)

As a key policy document for transport planning, this means that the NTP fully acknowledges pedestrian planning and issues surrounding it but does not address it appropriately. Hence, other 'hands' and the ground, like planners and engineers, are not at full liberty to execute what they do not have. For this reason, I approach this by looking at four issues, namely funding, land use, fragmentation and data that were highlighted during interviews with experts in the transport and urban land use planning field as shown in (*Figure 33*) below.

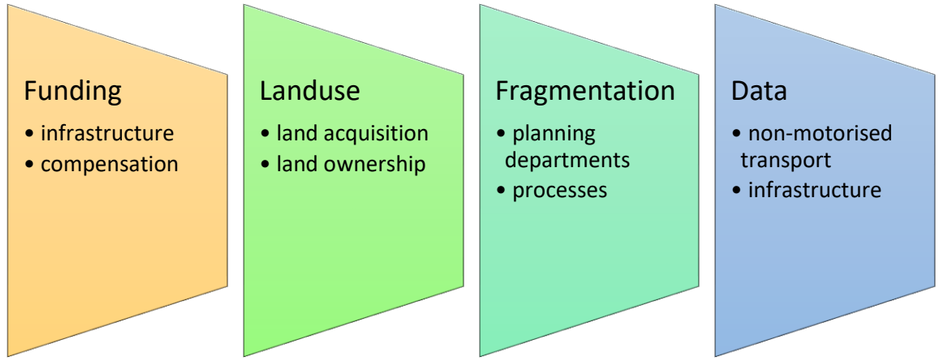


Figure 33 Existing issues of pedestrian planning in Accra Metropolitan Assembly

- **Funding:** A top-tier reason for the non-prioritisation of pedestrians in the planning process appears to be funding. Experts claim that it takes a lot to build a pedestrian environment. For instance, creating walkways where there are none requires demolishing sprout developments in the vicinity, which will also require compensation to the owners.

  "...You have an optimal design that addresses all road users, but then your funding is limited so you have to go to option two which denies certain category of road users opportunity, with the hope that when you secure the additional funding, you tackle that issue." (EXP01)

  "…Then it really comes because of the government priorities unless there's an overwhelming number of accidents and loss of those things. Then it will cause a push for finding funding for this interventions." (EXP01)

  It is gathered that experts and other stakeholders hope for more collaborations with external bodies to be able to establish this ground of prioritisation of pedestrians and other NMTs. However, it is unclear what role this funding could contribute. The documents reviewed do not provide the actual actions or toolbox we could assume they would actualise when given full financial capacity.

- **Land use**: Another issue that came up was that of land use. The land tenure system in Ghana puts the traditional leaders as the main custodians of the land. It creates an issue of initiating developments where they need to be. One dimension that an expert raised was that when compensations are supposed to be made, it is difficult to trace the landowners to act duly in cases of expropriation. This makes land acquisition for developments a difficult task for planners.

  "…Obstacle related to land use and acquisition of right of way. And the use of right to free protection of right of way. Because space which could have been used to support NMT movement either is difficult acquiring or when you acquire it, it's difficult to protect it. And so it doesn't do its intended, use or purpose…." (EXP01)

- **Fragmentation**: There appears to be fragmentation in the processes as well as the transport system. The experts report that since the ministry was recently setup with new operation, there are still undefined functions. This results in non-consolidated, disorganised structure of urban mobility in AMA. Policies are issued from the central government, and sometimes implemented by the government. With the different assemblies to cater for their independent projects in the best way they possibly can with minimal power. An expert explained this as

  "…Apart from the land administration challenges we have the system for land use planning. They are now trying to structure it over there. Land use and Spatial planning authority, but again, there is a fragmentation of assemblies. So, who has the power to have a plan that is continuous across Authorities. And the question then you asked again has to be central government and then this. It's not easy." (EXP01)

  Meaning that if there should be any major needed changes at the local level, it would still have to come from the central government. Thus, if the central government does not see an issue with it, there is no urgency in tacking pedestrian planning.

- **Data**: The underlying issue with pedestrian planning in Accra Metropolis is that there is little to no available data on pedestrian or NMT-related issues. For instance, there is no data on the level of service of pedestrian infrastructure, the facilities, and user satisfaction. Experts' response to these boils down to the issues mentioned above of funding, land use acquisition and fragmentation of plans with the different arms of the ministry of transport.

Other issues that arose concerning the pedestrian planning processes in Accra was user behaviour. It was acknowledged that most often, pedestrians tend to use areas convenient to them, which may not be statutory. It was also noted that the stipulated areas for pedestrian use where the pedestrian does not deem right to use are taken over by encroachers such as hawkers, taxi drivers, porters, and informal markets.

5.2 *Summary, Outlook: Performance of the walking environment*

On the performance of the walking environment, it is established that there is an apparent direct relation between positive indicators of spatial conditions. This appears in a way that when they are present in the environment, there is a strong likelihood that the environment is performing well for walking. When these indicators are present, the implication of performance reduces for walking, as demonstrated in 5.1.1 above. On the other hand, the negative indictors of the walking conditions in the environment have a rather inverse relationship with the performance of the walking environment.

However, regardless of the presence of negative indicators that as path obstructions (3), street parking (8) and Informal markets (14), the influence of the absence of the positive indicators on existing walking conditions in the walking environment appears to be rather ubiquitous in Accra CBD area. As the composite model indicated, the redder the areas become, the less performing the conditions necessary for walking. This in turn, makes the area less walkable for pedestrians. The implication is that the proclivity for attracting pedestrians reduces as the walking environment is not performing.

From the planning processes, it may seem that non-motorised transportation and its components like walking are addressed generically in the key policy document. The national transport policy has few actionable strategies

to tackle them. Aside from the two strategies mentioned, all other objectives and strategies with respective goals appear to vaguely consider pedestrian or NMT (as it is mostly referred to). The strategies seem to address a general transport issue. For instance, strategy 1 of 4.2.1.1 targets a systematic upgrade of all transport modes. To what extent? In which dimension – service or infrastructure? With a strategy to "systematically upgrade all modes of transport to better serve the public"

Strategy 1 seems to align with the UMI, which suggests that the walking environment is well accessible and reliable for non-motorised users in relation to all other modes. These strategies appear to sum up bits of traversability, compactness and physical enticement. Unfortunately, it cannot be further explored in the policy document because no specific actions say exactly what it entails.

Strategy 2 appears to actively work on creating a strict territory for the pedestrian, free from invaders who are quite prominent in the local context. This strategy might help singlehandedly tackle one of the spatial conditions that are evident in the local area.

This would likely yield an obscure overview of what is happening in the walking environment and how to address them. With the proposed and tested normalised aggregation of the indicators, could come in handy in proposing understanding and formulating actionable strategies to address the performance of the walking environment to understand what is happening and what could be tackled. This could conceivably suggest an actionable method to improve pedestrian planning in the metropolis.

5.3 The quality of walkability conditions (policy documents, interviews)

In theory and existing literature on walkability, they often refer to the ease of access to the walking environment, the attractiveness of the environment and the built environment around it(Forsyth, 2015; Forsyth & Southworth, 2008; Lo, 2009). For this reason, I gathered insight into the three main elements of walkability (see 2.4): Traversability, Physical enticement and Compactness of the walking environment. These elements provide have been noted to contribute to the quality of walkability conditions in the walking environment.

Traversability of the walking environment

The traversability of a walking environment is the ease of access that the walking environment provides for pedestrians. It has been identified that this attribute of the walking environment forms a basis for most walkability definitions. The underpinning indicator is the presence of the walking infrastructure – walkway, sidewalk, pathway, footbridge and so on. It is also evident in the availability of certain amenities that are useful for the movement of pedestrians throughout their journey. For example, the availability of lighting gives the avenue for people to be the ability to access the environment at certain times of the day physically.

In the local context, experts believe that more than infrastructure is needed to have the quality of the walkability conditions enough to support traversability.

> *"…Those are some of the things that I mentioned that it takes enforcement to really make these places pliable. Otherwise, you have market women and shop owners just spilling over to pedestrian walkways, so it makes traversing those places very difficult."* (EXP04)

With a stringent measure, what is 'available' to support traversable journeys will be sustained in the walking environment. From his expressions, he indicates that these enforcements will put people in check. Especially those that restrict the movement of pedestrians on pedestrian paths such as hawkers, informal markets, street parking and other obstructions (see 5.1).

> *"…Probably a place where it would have taken a very short while to move from A to B. You might end up having to go around in circles […]. And that also informs that yes, we haven't really planned for this. It is more or less we let the situation happen and then later we try to find a way around it to correct certain things and that makes it more difficult …."* (EXP04)

This already suggests the local context does not plan with the element of ease of access in mind to improve the quality of the walking environment and conditions within

Physical enticement of walking environment

The physical enticement refers to the attractiveness of the walking environment. It considers the presence of aesthetically pleasing elements in the environment to encourage walking. This relates to the path condition, cleanliness and maintenance of the path and absence of obstructions. There appears to be a mix of subjective and objective terms here. However, the conditions that contribute to the enticement of the environment cannot be ignored in identifying optimal situations for walkability. The difficult part is figuring out what is pleasing to different groups in society. For instance, it could be that the vibrant youth are attracted to graffiti on walls. Other older groups may be drawn to greeneries, lawns, and hedges with fountains. Nevertheless, all these elements provide some form of visually pleasing satisfaction for walking.

In the Accra CBD, it was realised that the attractiveness of the area is based on locational disparities. This could be attributed to the land use – commercial areas appear to lack cleanliness, maintenance and serenity (see Path Quality, 5.1). This is what one expert explained as

> *"…This is the high-end place so the kind of people who make use of those places and the kind of lifestyle it is that goes on in those places. They kind of buildings that you have there mostly would have proper designations for, say, discarding of wastes and all. But for this side, apart from the fact that the pedestrians are not really being catered for, even where to dispose of is also another issue. And then because of the market activities around those areas to you can you attached to how our marketplaces could be so. Yes, there's that kind of unclean measures over there."* (EXP04)

This could mean that if the environment is not catered to produce conducive quality for walking, it reduces the likelihood of people wanting to use such areas.

Compactness of walking environment

The compactness of a walking environment refers to the density of the environment. The dynamics that is present in the urban space create room for interactions for pedestrians in the walking environment. This relates to easy access to amenities and services. These include but are not limited to restaurants, parks, restrooms, benches, ATMs, places of worship, and bus stops and transport yards.

As it stands, most countries and cities develop indicators for measuring walking based in their suitability to the city's characteristics. As such it is almost easy to adapt 'best practices' for walking to the current status of a particular city – either to encourage walking or promote the sustainable impact of walking to the quality of life of inhabitants. The UMI provides best practices in the form of indicators for walking for cities towards sustainability. These inputs are derived from good examples of cases of cities such as Vienna sampled by the Walk21 and UITP.

5.3.1 Key Principles from The Urban Mobility Indicators (UMI) Based on Walkability

The International Association of Public Transport (UITP) and Walk21 Foundation recognise four factors that influence the access, safety, efficiency, and affordability of transport -specifically walking and public transport for urban cities. These factors are namely Comfort and Safety, Service demand, Connecting destinations and Support and encouragement. These four components provide a comprehensive framework for providing maximum satisfaction for people who choose to walk. They highlight best practices for walking situations. UMI appears to be easily adapted to various contexts of traversability of path, physical enticement, and compactness.

The UMI targets the comfort and safety of the environment by providing easy access to and through infrastructure and services, improving traversability. By providing elements that pedestrians can look up to in the form of information and a serene environment, for instance, forms an attractive environment for pedestrians. This speaks on the physical enticement of the environment. Compactness is addressed here delivering to the pedestrians the means to engage with the built environment and its activities and services. Below (Table 2) that highlights specific indicators in the UMI and how they contribute to providing a mix of traversability, compactness and physical enticement of the environment towards walkability.

From the table above, it appears that most of the sub-indicators present in the UMI are directly related to the traversability of the walking environment. Although it has been argued that a combination of the three elements, namely traversability, physical enticement and compactness, yield walkability to a greater extent. This is an interesting finding yet not surprising. As previously mentioned, the ease of access in a walking environment forms a fundamental part of defining how walkable the space is. This means that for a place to be confirmed as walkable or not, it must at least provide a traversable means for walking. However, it is noted that that UMI does not provide an extent of traversability for the pedestrian space. This point will be addressed in later sections.

Seen that various measures have been developed locally (*see Table 3*) and internationally such as the UMI (*Table 8 below*) for measuring the quality of walkability an environment exhibits. Thus, it becomes imperative to consider what these two sets of indicators contribute to the collective quality of walkability in the local level, in this case the Accra CBD.

Relating the local context to matters of traversability, physical enticement and compactness, it was identified in a series of interviews with experts that these three elements are considered in pedestrian planning and design – however, to some extent.

> *"…We are moving towards it, but there is user behaviour modification that is required. That both sides must meet each other halfway. And the culture does not support…."* (EXP01)

This expert believes that combining these elements to work in the pedestrian space to improve walkability would require more than just the supplier catering to demand. But also, the users have a role to play. Thus, regardless of the elements of traversability, physical enticement and compactness, there will be the other side to getting users to stick to their end of the bargain. This means that even if the necessary elements and indicators are implemented to support walking, it solely depends on the pedestrians and how and when they use it.

Contradictorily, other experts think that that aspect of the transport planning is not up to par; hence does not specifically look out for these indicators. This results from prioritisation, *"…So, I said we have a bigger issue if I should put it, we have to contend with inadequate infrastructure to support our mobility systems. That is on one side. So for me it's a matter of how we are prioritising the intervention such that for NMT come almost at the last when in terms of the scheme of things and the development."* (EXP03)

Some other experts also think that

> *"…There has not been much on this, the ones I read so far, they are not related to, they are not policies that have been drafted by us here. it's not that these things are gaining the attention of policy makers and the general public. So of course, in our developing of policies for walking all these factors will come to play. We will look at our context and then apply them."* (EXP02)

> *"…How easy is it for them[6] to move from point A to point B and all the traversability as you said, physical enticement and all that, I don't think we have figures or some reports to speak to. Maybe we were taking more intense of the hardcore infrastructure, looking at the length of the NMT and all that. But even to even go a extend up whether even the NMT infrastructure that has been put up is being used is also another area where we need to look at."* (EXP03)

5.4 *Summary, Outlook: The quality of walkability*

What is seen as the quality of walkability conditions in the walking environment emanates from the identifying the indicators of spatial conditions and nonspatial. And how they relate to creating ease of access for walking, attracting people to the environment and how closer the built environment is. identified as well as the challenges that planning authorities report on.

Looking at the UMI with best practise indicators (see Table 8) gives the impression that indeed the Ghanaian, more specific to the Accra CBD (see Table 3) does fit what the UMI suggests. The indicators developed for Accra focuses more on the walking infrastructure and the performance of it. However, it does not consider to a greater extent the air quality, noise quality, access to information. These are indicators that UMI exhausts enough attention on, which is likely to increase the quality of walkability conditions in the environment.

Looking at the local context from what experts' report, it appears as though the quality of the walkability condition is due to the planning process. This seems to boil down to the issue of non-prioritization of pedestrian well enough in policy formulation. What is seen in the environment, the quality of it is because they are not planned for by authorities. Although they are very much informed on the current issues, they failure to better evaluate the situation to see what can be improved. Perhaps, it is because of insufficient funding, land use dilemma, fragmentation of activities and commands and unavailable data that this is so.

Having the UMI as a guide with best practises can already inform on what indicators to improve on to best fit the local context.

[6] Referring to pedestrians

Table 8 Urban Mobility Indicators (UMI) for walking according to Traversability, Physical enticement, Compactness and Applicability

Indicator	Sub indicators	Traversability (ease of access)	Physical enticement (attractiveness of environment)	Compactness (density of the built environment)	Applicability/Comment
A1. Overall experience	A1.1 Walking satisfaction	x	x	x	That provision is made in the walking environment to provide level of satisfaction directed that contribute to the overall experience for pedestrian
A2. Safety	A2.1 Provision of safe crossings	xx			That the environment has means to aid safe crossing for people such as at-grade crosswalks, pelican or puffin (controlled) crossings
	A2.2 Sense of safety from injury caused by motorised transport or cycling	x			Providing for physical measures to separate pedestrians from other road users to promote a sense of traffic safety such as blockades, metal bars, and raised pavements
A3. Security	A3.1 Sense of personal security	x	x	x	Providing for physical measures of surveillance that gives pedestrians an impression of personal safety
	A3.2 Level of human activity			x	Providing for a measure to control the level of activities and interactions among humans in the environment
	A3.3 Perception of safety for women			x	Catering to measures that would improve women's perceived safety for the environment.
	A3.4 Availability of lighting	xx			Ensuring that there is available lighting. However, it does not specifically imply the functionality – something to look out for.
A4. Walking infrastructure	A4.1 Provision of walking space	xx			Providing for an environment or a territory for pedestrians to walk. A space that is not just an extension of a carriageway. Examples include walkways, footpaths, pavement and footbridges.
	A4.2Quality of pavement materials	x	x		Considering the quality of the materials used for the pedestrian space
	A4.3 Maintenance level of the walking surface	x	x		Ensuring that the path space is in optimal condition. Also, relying on quality materials for production
	A4.4 Cleanliness of walking environment	x	x		Ensuring that the path environment is tidy
A6. Operational performance	A6.1 Average reliable services		x	xx	Providing access to services closer to the pedestrians. Such as restaurants, bars, places of worship
A7. Impact of motorised traffic on walkability	A8.1 Sense of appropriate traffic speed	x		x	Ensuring that pedestrians are not intimidated or overwhelmed by the traffic flow by providing traffic calming measures like traffic lights and other road furniture
	A8.2 Sense of noise		x	xx	Ensuring the that the activities in the environment do not overwhelm the nice and quietness
	A8.3 Sense of air quality		x	xx	Providing measures to ensure serene environment a, fresh air circulation such as greenery and avoiding pollutants
	A8.4 Sense of impact of parking	xx		x	Ensuring the pedestrian space is not invaded by vehicles forcing pedestrians onto the carriage way
C1. Access to public transport stops	C1.3 Availability of motorised transport			x	Providing means where pedestrian spaces are connected and continue through a network that links other modes of transport
D1. Information	D1.1 Ease of wayfinding	x	x	x	Providing the pedestrian with avenues where they can easily navigate through the environment
	D1.2 Satisfaction with maps, timetables, and journey information	x		x	Ensuring that information systems are readable, audible and reliable in assisting pedestrians
D2. Availability of walking amenities	D2.1 Provision of pedestrian orientated amenities such as bins, lighting, seating and signage		x	x	Giving the pedestrians adequate amenities that are useful for moving through the space

Note**: *x*** the indicator is related/targeted to some degree, ***xx*** directly related/targeted specifically
Source: Authors construct based on Urban Mobility Indicators (2019

5.5 Perceptions of mobility wellbeing (interviews)

In series of interviews with pedestrians, the researcher resorted to finding out the perceptions of pedestrians of their walking environment. Mobility wellbeing is a combination of safety, comfort and convenience. Thus, the perceptions of pedestrians were investigated by their feelings, reactions, expectations and experiences of the safety, comfort and convenience of the walking environment.

5.5.1.a Safety

Respondents were shown photos to express their perceptions towards them, which was one way to get the perceived mobility wellbeing. For safety, it was easier for people to express their feelings towards the photos shown. As indicated below (*Figure 34*), several keywords were used to express how safe they (would) feel. The figure below indicates the most talked about elements in the interviews

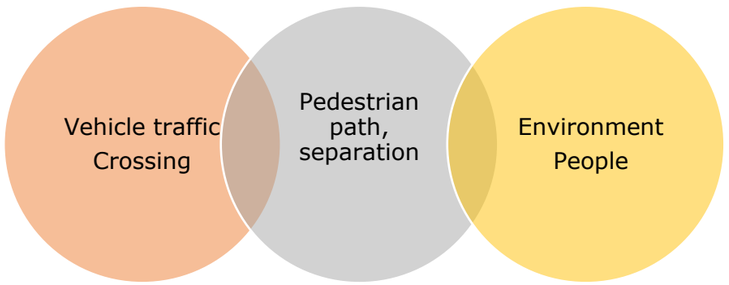


Figure 34 Key elements relating safety

Safety vs Vehicle traffic

People perceived certain areas as not safe because of the level of vehicle traffic. This was also linked to other factors like crossing and road size. Like this, pedestrians feel the road will be much safer if there are not too many cars around. That, "…*Car can lose control of their brake and knock you down."* This was expressed in situations with no "pedestrian separation" or space for people to walk. *"…A lot of cars. Walking I have to watch the cars. You need to be alert. Least mistake you will be knocked by a car. You need to be very attentive."* (PED22). One pedestrian expressed this as *"…there is no place for pedestrian to pass. Car can knock you down because there is no way for you to pass."* (PED11).

In a different light, most were concerned about personal safety with the vehicle traffic. "…*There are too many cars and you easily be rob. Even when you are in trouble you might not get help.*" (PED04). Another respondent reacted, *"There are no cars on the road …. I was once robbed in a space like this because I prefer to walk in spaces without too many cars and people*." (PED02).

This could mean that as some pedestrians regard the presence of "cars" or vehicle traffic as some sort of informal surveillance, others do not share the same sentiments. Or may rather also feel indifferent about it.

The road or street size indicates how safe pedestrians feel in the walking environment.

> "*The road is narrow for both car and pedestrian. It is risky. You can easily lose your life if God does not intervene because image two cars on this narrow road. How do you manage as a pedestrian if either one of them tries to manoeuvre. You either die or end up at the hospital*." (PED02). In other cases, respondents believe that even in the absence of a traffic, the road size plays a role in the safety of the pedestrian. *"…Not a busy road but the road is too small and there is no pavement. In case you have cars moving on both sides, you will not be safe"*. (PED19

Safety Vs Pedestrian path

The pedestrian space, or rather "pavement", as it was often referred to, is one of the top safety indicators for pedestrians. It was identified as one of the revered elements that pedestrians relate to safety, personal or traffic. "*There is no pedestrian path. So were I walk, cars can also pass there. A car can knock me down at any time…."* (PED11). Another respondent believes, *"There is supposed to be a fence between the pedestrian and the road so that if a car should lose control of the brake then there should be something to protect the pedestrian."* (PED13). Likewise, a pedestrian also thinks that *"…if you look at the road, the contractor made a pedestrian way for people walking so that they are safe from vehicles." (PED11)*. This shows that the pedestrians are much aware of their territory and the freedom it wields. However, one of the interviewees sincerely shared, "…*In as much as am using the pavement anything can happen. You can't be 100% safe."* (PED21). On not being "100% safe", another person shared his encounter that,

> *"... motor driver intersected from a certain angle and because there was a pedestrian walkway though but there was no metal, so the driver and motor driver just entered the pedestrian walkway and hit the pedestrian who was pressing phone because he was not paying attention to the main road. When things like these happen, I really feel unsafe."* (PED22).

This highlights the insecurities accompanying sharing roads with other (motorised) road users.

Safety vs Cleanliness

Interestingly, it was observed that most pedestrians were concerned about the physical nature of the environment they walked through. A pedestrian shared that even though a place has the best conditions in terms of infrastructure, the environment itself can breed other unsafe means "At the *Achimota forest, walking at CP where the forest is, the place is bushy. Even though there is pedestrian walkway there, robbers can be in the bush."* (PED20). There were reactions toward the serenity as well as the cleanliness of the environment with respect to the safety.

5.5.1.b Ideal safe walking environment

The next part of the interviews was concerned with what pedestrians thought would be an ideal safe environment. Respondents were asked to indicate elements they would like to see in the walking environment that would make them feel safe. The following elements were pronounced in the responses; pedestrian path, pedestrian separation with barricades, security, and road signs. One pedestrian narrated that,

> *"…There is a lot of traffic. We should have a pedestrian walkway and have some metal to divide the main road and the pedestrian walkway to the point when you are walking, and somebody slip or if there is unexpected [...] cars are machines so if drivers lose their way, there will be this metal that will guide them from hitting pedestrian on their side. And also, maybe about 100meters distance there should be zebra crossing that people are going to respect it. so that if I walk for 100 meters I can cross rather than crossing at any point causing a lot of road accidents."* (PED22).

Surprisingly, not many pedestrians commented on streetlights as an obvious response to safety. There were comments on this but not a lot, perhaps because most photos shown were taken during the day.

The outcome implies that ideally, according to the perception of pedestrians, the walking environment should have a separate pedestrian path from the carriageway, adequate security/personnel, traffic light and other road furniture to be safe for walking.

Box 2 Excerpts of pedestrians' reactions to safety

"I should see a speed ramp to slow down cars especially for the night. there is a paved walkway for pedestrians to use and in the day." (PED17)

"There is a place for pedestrians to walk and the environment seems neat. Everything looks organised." (PED08*)*

★★★☆☆ Location: Liberia Rd, Accra (Accessed 09/05/2022 17:50)

"…the entire road is not good. It is full of dirt, gutters are choked with waste, and also the walkway is occupied by market people hawkers. Like we always say, keep Ghana clean. This is hence unhygienic environment is not good for health." (PED17)

"In terms of cars there will be very few cars to worry about . Looking at the environment, I am more concerned about my health condition." (PED22)

★☆☆☆☆ Location: Agbogbloshie Rd, Accra (Accessed 09/05/2022 21:37)

"I see pavement and metal bars on the pavement so it is safe." (PED10)

"The place is clean. There is a place where people pass." (PED08)

"There is enough space for you to pass." (PED14)

★★★★☆ Location: Liberia Rd, Accra (Accessed 09/05/2022 21:35)

Photos captured from Google Maps via street view (2016)

5.5.2.a Comfort

From the interview with the pedestrians, it was realised that some keywords that surfaced were similar to the those mentioned above. However, the one worth highlighting are shown in the *Figure 35* below

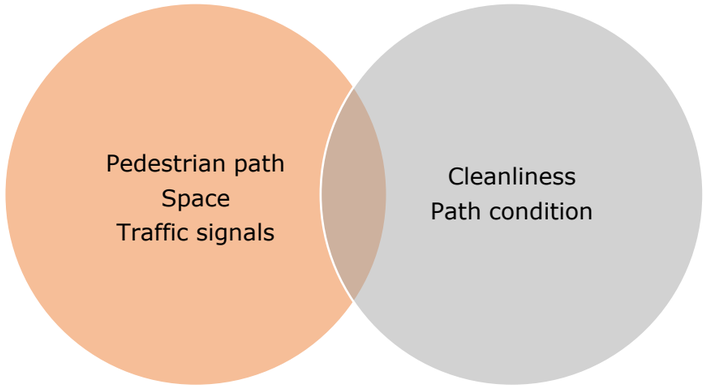


Figure 35 Key elements relating comfort

Comfort vs Space

The availability of space was observed to be one of the interesting elements that pedestrians spoke about with regard to comfortability. It was mostly related to the other factors like the level of vehicle traffic and also frequently with pedestrian path. Some of the pedestrians believe that a place is comfortable when "*There is traffic and there is enough space so there wouldn't be congestion."* (PED14). Meaning that regardless of the congestion, if there is available space for a person to access a pedestrian walkway, it is satisfactory. However, in a case where there is no space or path for pedestrians, a participant feels that *"there is no pedestrian walkway, cars and human beings struggling for space to pass should in case the place be chocked."* (PED13)

On the other hand, other pedestrians regard a walking environment as not comfortable when *"The walkway at the roadside is very tidy, with enough space for pedestrians to use, high comfortability. Also, the trees around provide shade when there is too much sun."* (PED15). Likewise, other people also share that when the road size is not appreciable, it also affects the comfort of walking. *"There is no pedestrian lane. Where car passes that's where people pass. There are no free movement of car and people."* (PED11).

> *"…sometimes when you are walking you have to stand somewhere for the car to pass before you also move."* (PED09)

> *"…sometimes you might be on the pedestrian walkway and you think you are on your own and there you will hear the drivers, 'Pee! Pee! Clear road!', and it makes me feel uncomfortable"* (PED22)

Another scenario of pedestrians not feeling comfortable in a walking environment regards traffic signals for calming traffic and enabling crossing. "*There is no traffic light on the road. It is not so easy to cross to the other side. Even the cars are speeding very much*."

> *"There is road symbols that when someone is crossing they know they can cross. And drivers also know that when there is crossing, people can cross."* (PED11)

It is important to pedestrians that not only are they aware of what to do in the environment but also other road users. Thus, the importance of traffic signals and other road furniture

Comfort vs Cleanliness

The physical surrounding is one of the elements that pedestrians identified to contribute to comfort. Several other elements come to play here; the cleanliness of the walking environment, serenity and obstacles. Also, considering the physical condition of the road or path, they share that in a serene environment with greenery, it is comfortable to walk. *"The trees will provide shades, be it raining or sunny, sometimes to release stress when you are tired and the sun is scorching."* (PED13). Pedestrians explain that when the environment looks clean with no obstructions such as parked vehicles, stores, hawkers, and others, the environment becomes conducive for walking. They reacted as

> *"The road is not properly done and the environment is very bad. Not conducive for people to be walking…."* (PED07).

The pedestrians (participants) felt that the environment should be tidy with no obstacles to provide comfort.

5.5.2.b Ideal comfortable walking environment

Similar to the section above, respondents were asked to share their ideal walking environment in terms of comfortability. In all, the following elements were common in the responses from the interviews; pedestrian path, crossing, traffic light, shade and streetlights. The respondents appeared unanimously agree on this. It is better highlighted by a respondent who stated that,

> *"…Well when you say comfort you know it means when you feel okay, no stress. So, when you are walking by I feel like sometimes you will be walking on the pedestrian walkway and motors will be doing 'Pee! Pee[7]!'. So maybe there should be motor walkway and the road, pedestrian walkway and their road. and it should be at a point where when you are walking you will not be disturbed by the other side. So, when I am using my way, I know it is just, my way. and there is metal. so that when a driver loses their way then you are safe."* (PED22).

Other respondents showed interest in having "… waste bins around to dispose trash." (PED12) and "*…fence and a place for shelter with lovers bench."* (PED13). They are interested in amenities supporting walking and pedestrians through the pedestrian journey.

In all, it was gathered that pedestrians are likely to attribute the comfort of the walking environment to having a pedestrian path with crossing facilities aided by traffic lights as well amenities to support pedestrian journey.

[7] Mimicking the sound of honking car's horn.

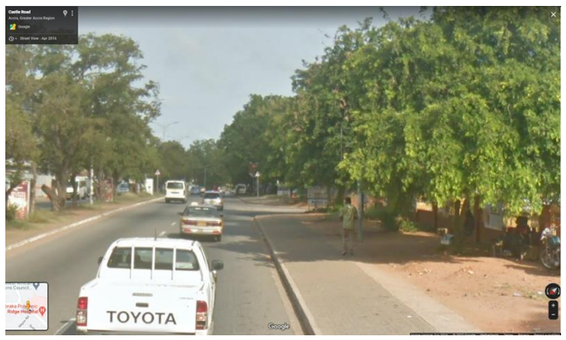
Box 3 Excerpts of pedestrians' reactions to comfort

"The road is quite open. But the condition of the road is bad. There are a lot of rubbish which will give bad odour. I cannot even eat there, you lose appetite." (PED02)

"The road is not well done and there are no pavements." (PED10)

"There is no pavement. People and car share the same path. It is easy for car to knock you at any time." (PED11)

★★☆☆☆ Location: Agbogbloshie Rd, Accra (Accessed 09/05/2022 21:18)



"The walkway at the roadside is very tidy, with enough space for pedestrians to use high comfortability also the trees around provide shade when there is too much sun." (PED15)

"…free movement on the pavement. You will not suffer. And it is not easy for cars to invade the pavement." (PED11)

"…There is nothing stopping you." (PED03)

★★★★☆ Location: Castle Rd, Accra (Accessed 09/05/2022 21:37)

"The environment very neat. Good road. […] there are paths for pedestrians to pass, no traffic. There is comfort in walking and the zebra crossing is even available for you to cross." (PED07)

"The road is well demarcated with white lines" (PED10)

★★★★☆ Location: Liberia Rd, Accra (Accessed 09/05/2022 21:34)

Photos captured from Google Maps via street view (2016)

5.5.3.a Convenience

During the interviews with pedestrians, it was realised that the recurring keywords like pedestrian path, environment, crossing, vehicle traffic, pedestrian separation and road size. However, the most interesting worth mentioning ones that I came across were crossing, security, obstacles (see Figure 36 below)

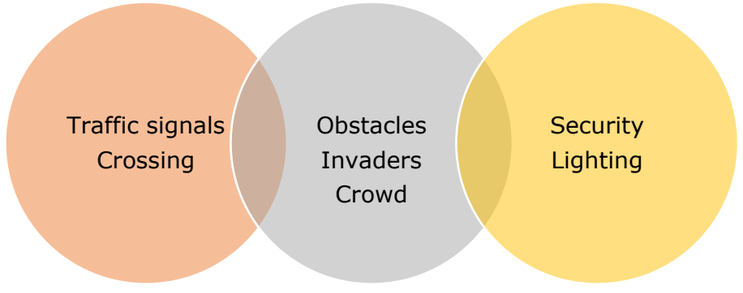


Figure 36 Key elements relating to convenience

Convenience vs Crossing

From interviews, it was gathered that the ability to cross a road is one of important things related to convenience. Thus, for an environment to be convenient to walk it should be able to provide means of crossing. This is what a pedestrian explained as

> *"… There are people who have houses around the highways. They have to cross to their houses. Because there are no check points for bus to park and places to cross, so they have to wait to cross"* (PED16).

In other instances, they refer to the inconvenience to the time. That in a case where vehicle traffic is intense, with no available crossing points it takes so much time to be given the opportunity to cross. *"…At the junction you may be in hurry to move but the cars may not stop for you. And there is no zebra crossing."* (PED17). It is possible that there may be a walkway however, some pedestrians share that it may not be sufficient, since at the end of the day they would have to wait for cars to move first to cross. For instance, according to PED15, even though "*there is a paved walkway for pedestrians, I worry about the car at the junction of the branch, I'm concern about the vehicle traffic. it will cause a delay if you are in hurry to a place."*. This could imply that convenience could mean being able to get to places on time while on foot.

Convenience vs Invaders

Another element that was acknowledge by respondents to indicate convenience of a walking environment is invaders. Invaders in the environment refer to informal habitants of the pedestrian pavement such as hawkers and beggars which seemingly contributes to obstruction for the pedestrian.

> *"… I do go to Kantamanto[8] every Saturday. As we all know the paved walkway is occupied by hawkers and market women, and due to that I have to be get to the vehicle's road to get past a hawker so I can go to where I am going. You know how challenging that can be because you can get knocked down"* (PED15)

This finding is counterintuitive to some extent as pedestrians already expressed how time matters most to them. The invaders contribute to obstruction to pedestrian movement. *"The place you are supposed to walk is used by hawkers and sellers. So, you have to use the road for the vehicle and you can be knocked down."* (PED19).

On the other hand, while number of people "invaders" on the pedestrian environment concerns some respondents, others value the presence of such. *"… There is market and environment is not clean. Anyone can attack you. Where not many people around. You can easily be attacked. Who do you call?"* (PED07). This way it can be interpreted that it is convenience of a walking environment lies within the level of activities going there.

Convenience vs Security measures

With regards to convenience, a recurrent element that emphasised in this section of the interview was security measures - personnel, barriers, and checkpoints. This is a rather unexpected outcome. Commenting on this, one pedestrian indicated that "*Places with no light, when you are walking you may have the perception that arm robbers will attack you which might not be convenient for you.*" (PED19). Another pedestrian also noted

> *"...there was a time I used a route I wasn't familiar with was at attack by bad boys. Even though there were cars walking around I was frightened. There was no streetlight. Actually, there were streetlights but there were not working"*- (PED06)

5.5.3.b Ideal convenient walking environment

The respondents were asked about their ideal convenient walking environment. Variety of elements was mentioned. However, quite a few were in common. These are pedestrian paths, road signs, streetlights, traffic lights and security. This view was highlighted by an interviewee who stated that,

> *"…It means that we should have these road signs. So that I know that at this point I should expect a zebra crossing in this meters. It makes the thing convenient, and they should respect that I am using it so they should respect so I just cross. Not that I have a pedestrians walkaway and motor drivers are using it cars are using it. it is not convenient. Convenience we are looking at using all the road signs and when I get to that point everybody has to understand the meaning of that and respect it."* (PED22)

On the other hand, one remarkable input by a couple of interviewees was the access to bus stops. They believe that if the environment gives appropriate access to other modes of transport, it will likely be more convenient for them. *"Having a bus stop at most of the roads provides convenience so you can move to areas you want."* (PED16).

This indicates the awareness of pedestrians of the connectivity of the road segment to other services.

However, this outcome indicates that pedestrians are likely to attribute the convenience of a walking environment to the availability of a pedestrian path separated from a carriage with appropriate road furniture, lighting, and security measures.

[8] *Kantamanto* is a one the popular market areas immediately outside the boundary of the Accra CBD area. It is marginally separated (location-wise) from Makola market which is the CBD.

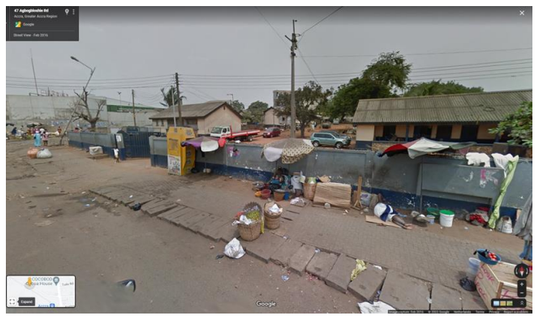
Box 4 Excerpts of pedestrians' reactions to convenience

"I will feel safe so it's convenient for me." (PED14)

"Pavement is small and thing over there has no traffic light directing traffic." (PED10)

"The environment is serene and there is a path for pedestrian." (PED08)

★★★☆☆ Location: Castle Rd, Accra (Accessed 10/05/2022 12:44)



"…The place looks dirty. The smell alone is a turn off." (PED13)

"Things are not put in place that makes you walk straight, which decreases the travel time but instead some places are curved. and the curves delay time." (PED19)

"The road looks dirty and it's not convenient for both pedestrian and car." (PED09)

★★☆☆☆ Location: Agbogbloshie Rd, Accra (Accessed 09/05/2022 21:36)

"There is no traffic light at the junction and there are no pavements." (PED10)

"The road is okay, but it is not really okay. And there is no path for we pedestrians to walk but the road seems cool, and the environment is okay." (PED08)

"The curve help does not help. It is not safe. If you walk here you easily be knocked down and killed. There are a lot of things to distract you." (PED02)

★★☆☆☆ Location: Okaitei Nettey Rd, Accra (Accessed 10/05/2022 14:01)

Photos captured from Google Maps via street view (2016)

5.6 Summary, Outlook: Perceptions of mobility wellbeing

The mobility perceptions of mobility wellbeing of pedestrians are a combination of how they feel in the walking environment regarding safety, comfort, and convenience. Common elements appear to cut through all three of safety, comfort, and convenience.

It seems rather obvious that pedestrians' perception of wellbeing in the CBD area surrounds their space – a separate haven from the carriageway. The pedestrian space and path seem to cut through all angles.

Pedestrians in the Accra CBD are mostly triggered by what they see happening or lived experiences or expectations from the environment. The good part is that the expressions are made based on the quality they know or presume the environment holds. In all it can be established that the perceptions of pedestrians of mobility wellbeing elements of safety, comfort and convenience are all intertwined. There is no reason to separate what is safe from what is comfortable or convenient for the pedestrian's mobility wellbeing. However, the relationship that exists could be further investigated to understand the extent it influences the individual(s) decision or propensity to walk.

On the other hand, from literature (see 2.0) and evaluation of optimal spatial and non-spatial conditions (see 5.1), one can see what is optimal for safety, comfort, and convenience in the walking environment. However, there is an apparent difference between what people perceive as the ideal safe, comfortable, and convenient walking environment based on their understanding of wellbeing. The way pedestrians expressed their ideal environment depicts a strong knowledge of what they believe they are deprived. Thus, understanding people's perceptions of their wellbeing goes a little further to identify what they would consider safe, comfortable, and convenient, all other things being equal.

CHAPTER 6

DISCUSSION

Source: https://www.vogue.com/slideshow/gabe-stone-shayer-ballet-filled-trip-to-accra-ghana-travel-diary

6.0 DISCUSSION

Several scholarly works have been done on walkability in urban areas, however, they do not consider the experiences of pedestrians and the influence on their mobility wellbeing. This study explored the influence of walkability conditions in the walking environment on perceived mobility wellbeing in the case of the Accra Central Business District (CBD) area. Using interviews, observations, media analysis, and spatial analysis with spatial data, I was able to unravel the three SRQs for this study.

The subsequent sections tackle each SRQ and how they contribute to addressing the main question of "*How do the spatial and non-spatial conditions in the walking environment affect walkability in Accra to influence the perceived mobility wellbeing of the pedestrians?"*. For each SRQ, critical points for discussion are drawn out tied to relevant findings (5.0) that could help in answering them.

6.1 What are the existing walking conditions (spatial and nonspatial) and planning processes of walking environments in the CBD, Accra?

On providing insight on the current spatial and non-spatial conditions and planning of the walking environment in the CBD of Accra, the researcher resorted to measuring key indicators that were highlighted in media conversations and literature. The findings imply that the spatial conditions are the more physical conditions that are inherent in the walking environment while the non-spatial conditions are the nonphysical conditions expressed as feelings, experiences and expectations (perceived or actualised). Thus, existing conditions manifest in the performance of the walking environment which is attributed by the presence or absence of certain indicators (see *Table 3*). Therefore, the researcher is able to identify the walking conditions in the CBD area as the *Connectivity of path (*see *Figure 15), Quality (physical) of path (*see *Figure 19), Flow capacity of path (*see *Figure 23),* and *Continuity of path (*see *Figure 26).* In literature (Dovey & Pafka, 2020; Ewing & Handy, 2009; Forsyth & Southworth, 2008; Lo, 2009; Southworth, 2005), these conditions appear to be significant in defining walking environments. In the Accra CBD the following are what was found for;

Connectivity of path

From the findings, it was realised that the CBD does not have enough connecting facilities for pedestrians in the form of pedestrian facilities and crosswalks (see *Figure 15*). According to Southworth, (2005), adequately connected paths has the tendency to support walking activities of people to various destinations. The current situation in the CBD area suggests poorly connected pedestrian network, especially on minor routes.

Quality (Physical) of path

On assessing the quality (physical) of the paths in the CBD it was realised that the physical condition of paths in the CBD are appalling. There are several unclean and poorly maintained paths with less greenery (see *Figure 19*). This finding points to an unfavourable quality of path for walking in the CBD. Several studies (Forsyth, 2015; Litman, 2003; Mateo-Babiano, 2003; Rigolon et al., 2018; Shuvo et al., 2021) have underpinned that this condition is contributes to basics of encouraging walking.

Flow capacity of path

On the flow capacity of paths in the CBD, it appears the walking environment is majors obstructed by invaders such as informal markets and hawkers. Thus, the environment is characterised by fewer spaces left for walking (see *Figure 22, 23*). What may seem to be fundamental – pedestrian facility is also notably absent. In the absence of pedestrian facility such as sidewalk, walkway and footway, pedestrians are compelled to share space with the informal markets and vehicles. On the presence of informal markets, Amoako et al. (2014) rightly puts that they have slowly become a part of the walking environment in the local Ghanaian context. Their presence serves both a service and disservice to activities in the city (see p. 52). Thereby resulting in inadequate flow capacity of path in the CBD area

> *"… In some of the places where the walkways are encroached, they actually happen because people don't use it. So, they the shop owner will now who realizes that this space is there, but you barely find people making use of it and he thinks it is good for his business. So, before you know he's put his things there. then other people once they see the first person the next person also put it in before you know it's become a Market Square."* (EXP04, Personal communication, 2022)

Continuity of path

Following from the flow capacity and connectivity, it is realised these conditions also contribute to the continuity of paths in the CBD. Adding to Southworth's (2005) position on this, extent of continuity of a path is drawn from the connectivity of the same path. Thus, resulting a lot of discontinued access of pedestrian paths on the walking environment, especially around the commercial links (see Figure 33).

Moreover, from these spatial and non-spatial conditions are positive and negative indicators (see Table 4). The positive indicators support walking in the by their presence. On the other hand, the negative indicators of the walking conditions in the walking environment rather reduce the performance of the walking environment when they are present. These were found to be Path obstructions (3), Street parking (8) and Informal markets (14) (see *Table 3*). Regardless of the influence of negative indicators in existing walking conditions in the walking environment appears to be rather ubiquitous in the Accra CBD area. The blend of these is what is seen in the composite map *(*see *Figure 35)* which provides an aggregated overview of the existing conditions in the Accra CBD area.

Seeing that unfortunately, the CBD is majorly made up of an alarming low composite value (see *Figure 27*) which is informed by the mix of spatial and non-spatial conditions. However, since the aim was not to conceptualise the composite conditions, this information provides grounds on what is exiting in the Accra CBD area complemented by the spatial extent seen as the performance linking to the conceptual framework (see *Figure 3*). It is unlike the works Visvizi, Assem, et al. (2021) that uses the composite model to conceptualise the walking and walkability index of smart cities.

Planning process

For the most part, there appears to be a consistent chain of generic considerations for pedestrian-friendly environments and user satisfaction in the planning processes of Accra. From key policy documents like the National Transport Policy (2020), most arrangements (in terms of finances, logistics, manpower) are made for motorised transportations, and this is at the disadvantage of pedestrians (Lo, 2009). In a way, as more attention is drawn and given to the vehicles, who would cater to the pedestrian? Or rather, what is left to cater for pedestrians as all resources are exhausted on motorised transport that are arguably least sustainable. I therefore argue that transport planning in the Accra Metropolis ought to prioritize pedestrian comprehensively to inform the spatial and non-spatial conditions that exist in the walking environment.

As pedestrianisation is currently at peak of state of art discussions due to its contribution to sustainable mobility, literature such as (Amoako-Sakyi, 2013; Hidayati et al., 2020; Lo, 2009; Southworth, 2005) have to advocated

for the importance of prioritizing the pedestrian and the conditions available in the walking environment. Moreover, the current situation could be attributed to the fact that the organisation, planning and development of policies are done by the central body, that is the national authority and dispensed to the local Metropolitan Assembly for execution and implementation. Although stated that there is some level consultation with other bodies, this form of participation seems rather archaic or passive and insufficient in contemporary planning as compared to a rather collaborative and partnership level of approach. In the same vein, Buchy & Hoverman (2000) reckon that when considered, consultation could only prove fruitful if it is done before the initiation of the plans. In the case of the National Transport Policy, Ghana (NTP;2020), the consultation of other bodies is done after drafts were developed (Ministry of Transport, 2020).

On the other hand, it appears that the non-motorised transportation and its components like walking are addressed generically in the national transport policy document, that would likely yield a not-so-clear or obscure overview of what is happening in the walking environment. As it is, the potential spatial and non-spatial conditions, with normalised aggregation of indicators, give an understanding of what is happening and what could be done to improve on the existing happenings. This could conceivably already suggest an actionable method to improve pedestrian planning in the metropolis.

Due to the level of vagueness of objectives and strategies present in the policy document, it is not entirely possible to have a detailed translation and comparison and to what the ideal situation should be in the local context. It should be noted that further exploration into the available information might yield a lot of assumptions and speculations.

> "*The Ministry of Transport for instance, we made an attempt to do an NMT strategy for Ghana because we already had a policy. There's a need to transcend that into implementable strategies and action plan going forward and we had some assistance. But that process also got truncated along the line. So in summary, we have pieces and bit of information here and they at various institutions in terms of the planning of NMT infrastructure, there are some national targets, or national level indicators which particularly the ministries of Roads highways, together with its agencies, urban roads are planning towards."* (EXP03, Personal communication, 2022)

6.2 What are the optimal spatial and non-spatial conditions to encourage walkability?

How do the optimal spatial and non-spatial conditions translate in the planning and design guidelines and strategies to encourage walkability in the CBD, Accra?

On identifying the optimal spatial and non-spatial conditions that encourage walkability, it is realised from literature (Forsyth, 2015) and theory (see Figure 2) that the quality of walkability and optimality of is apparent in the combination of *Traversability, Physical Enticement* and *Compactness* the environment provides. On assessing the Urban Mobility Indicators (UMI), the optimal walkability (spatial and nonspatial) conditions are highlighted are highlighted as 1) Overall experience, 2) Safety, 3) Security, 4) Walking infrastructure, 5) Operational performance, 6) Impact of motorised traffic on walkability, 7) Access to public to transport stops, 8) Information, and 9) Availability of walking amenities (Walk21, 2019) *(see Table 8).*

For the Ghanaian context, the researcher referred to the spatial and non-spatial conditions developed from the existing conditions 5.1. By juxtaposing the indicators for Accra CBD to the UMI, the outcome from this indicates that the Ghanaian context does not fit the optimal conditions from the UMI. It was realised that the Accra situation was mostly infrastructural and superficial, whereas the UMI covers an in-depth depiction of considerations for walkable a city. To reiterate findings in key policy document the National Transport Policy (2020) (see 5.1.2) would less priority for pedestrians in policy formulation, are addressed generically in the document which would likely yield a not-so-clear or obscure overview of what is happening in the CBD walking environment and how it encourages walkability.

Though in several scenarios internationally, national policies provide a broader window for adoption, adjustment, and adaption, this should not give room for too much unclarity. Agreeing with Schrad (2010, p. 29) that by meticulous comparison of national policies with that of international standards helps discover inconspicuous disparities. In this case, this could be attributed to the lack of consideration in key documents like the NTP. Lastly that the planning process is unilateral in decision-making with fragmented execution and implementation of ideas in the system. This that could contribute to the less likely ideal walking situation for pedestrian planning in the CBD area and the Accra metropolis. Cobbinah et al. (2017), on the defunct planning process in the Ghanaian local context argues that "*There is little enthusiasm for reform of the urban planning systems in Ghana*."

6.3 How is the mobility wellbeing of pedestrians determined?

The mobility wellbeing of pedestrians is determined by the subjective perceptions of safety, comfort and convenience of the walking conditions and walkability of the walking environment. Various research (Amoako-Sakyi, 2013; Forsyth & Southworth, 2008; Kelly et al., 2011; Obeng-Atuah et al., 2017) weighing in on wellbeing for pedestrians consider that by looking at safety.

By consulting literature, it is realised that mobility wellbeing for pedestrians could go beyond safety. Through interviews with pedestrians in the CBD area, the researcher identifies the perceptions of mobility wellbeing through the safety, comfort, and convenience of the walking environment by showing a series of photos to pedestrians. These established conditions from literature and evaluation of optimal spatial and non-spatial conditions (see 5.1), one can see what is optimal for safety, comfort, and convenience in the walking environment.

The perceptions of pedestrians on their wellbeing were based on their feelings and experiences towards walkability conditions in the environment. The key findings indicate the perceptions of pedestrians of the walking environment are important in determining their satisfaction through experiences, realisations, and feelings. Similar outcome was developed from Visvizi, Abdel-Razek, et al. (2021) on conceptualising walking and walkability smart cities.

On safety, pedestrians' perceptions are channelled by the pedestrian path, vehicle traffic and cleanliness. For comfort, perceptions are more inclined to available space, road size and cleanliness of the environment. Lastly, for convenience, pedestrians' perceptions on wellbeing are drawn to the crossing facilities available, invaders and security measures such as police and police barrier. These elements are evident in fragments in existing literature such as (Lo, 2009) who strongly advocates that what is even walkable for pedestrian must first address the experiences of the users. On superficial level, Southworth (2005) visualises that element of safety, and comfort in the walking environment attracts pedestrians to walking environment. However, his contribution to this idea merely focuses on 'what to bring to the table' and not what do the users expect to have. These expectations, experiences and realisations are what determines the mobility wellbeing of pedestrians

Here the reasoning is that what pedestrians feel is a combination of what makes them safe, comfortable, and convenient in the walking environment. Where positive conditions are present, it shows a good impression of their wellbeing. However, there is an apparent difference between what people perceive as the ideal safe, comfortable, and convenient walking environment based on their understanding of wellbeing. This shows that to be fully aware of how an environment influences an individual, it is quite necessary to know what they think of an optimal situation and how it would make them feel.

7

CHAPTER

CONCLUSIONS AND RECOMMENDATIONS

Source: https://davidsbeenhere.com/2021/09/11/top-things-you-must-do-in-accra-ghana/

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

This research sought to explore the influence of walkability conditions in the walking environment and the potential for improving the perceived mobility wellbeing in Accra CBD. Specifically, the following SRQs defined the study.

- What are the existing walking conditions (spatial and nonspatial) and planning processes of pedestrian environments in the CBD, Accra?
- What are the optimal spatial and non-spatial conditions to encourage walkability? How do the optimal spatial and non-spatial conditions translate in the planning and design guidelines and strategies to encourage walkability in the CBD, Accra?
- How is the mobility wellbeing of pedestrians determined?

Using interviews, observations, media analysis, and spatial analysis with spatial data, as able to follow through from the conceptual framework (see Figure 3) to answer these SRQ. By doing so, I observed and measure the performance of the walking environment in the Accra CBD. Then, the indicators derived from the observations and spatial analysis are used to compare to ideal walking situations. Further contrasted the ideal situation to the current situation ascertained. Finally, photos were presented to pedestrians in the CBD area to acquire their reactions in the form of perceptions of the conditions and the influence on their mobility wellbeing. In the subsequent paragraphs, each SRQ is addressed.

What are the existing walking conditions (spatial and nonspatial) and planning processes of walking environments in the CBD, Accra?

The existing walking conditions in the environment, in the form of spatial and non-spatial conditions are the *Connectivity of path*, *Quality (physical) of path*, *Flow capacity of path* and *Continuity of path*. By taking indicators developed from preliminary analysis of discourses from media literature and observing these indicators via Google Street view. It was discovered that there is a seemingly entwined relationship between spatial and non-spatial conditions in the walking environment. Using a composite index to measure the performance of the walking environment and highlighting the conditions mentioned (see *Figure 27*).

The findings indicate that there is insufficient pedestrian infrastructure such as crosswalks and walkways to support connected movement from one point to another (see *Figure 15*). On the quality of the path, it is realised that the environment is not doing well on the number of green spaces and cleanliness available for pedestrians (see Figure *19*). The flow capacity of the path in Accra CBD shows the disturbing presence of informal activities such as informal markets and hawkers obstruction the movement of pedestrians in the CBD (see *Figure 23*). Finally, the continuity of path in the CBD alarming patches of discontinued paths with obstructions and deteriorated path materials (see *Figure 26*).

Fundamentally, there is a seemingly entwined relationship between spatial and non-spatial relationships because spatial conditions measured are the physically evident situations, but the non-spatial conditions also give them context.

To understand the planning process, I looked at the key policy documents like the National Transport Policy (2020), the National Transport Policy (2008), and the Pedestrians Safety Action Plan 2018-2022 (2017). Also supported by interviews with experts, the main discovery was that pedestrian planning is not prioritised in Accra.

From the insights above, it can be concluded that the happenings in the walking environment are because of the non-prioritization of pedestrian. This is an expected development, looking at the striking conditions evident in *Figure 3*. It is clear that the conditions and state of the walking environment in the Accra CBD area, and how that is likely to discourage walking in the CBD area.

What are the optimal spatial and non-spatial conditions to encourage walkability? How do the optimal spatial and non-spatial conditions translate in the planning and design guidelines and strategies to encourage walkability in the CBD, Accra?

The objective of this SRQ was to explore planning and design guidelines and strategies for improving spatial and non-spatial conditions of the walking environment to encourage walkability in CBD, Accra First to answer what optimal walking conditions are, it is necessary to infer from the existing conditions to see the what the ideal situation is. Looking at the indicators (see 5.1) developed for the CBD area vis-à-vis the UMI gives the impression that what we have in the Ghanaian context is superficial. Such that the UMI indicators do not absolutely fit in the local context. Major aspects such as the assessment of air quality, noise quality, information access (Chapter 5). In this case, I looked at one of the best practices standards for walkability and pedestrian planning which is the Urban Mobility Indicators (UMI). Looking at the UMI gives the impression that what optimal does not merely focus on the physical conditions but also some aspects of air quality, noise quality as well as perceptions of safety for women.

From this comparison of walking conditions and indicators, not all the conditions are applicable to the Accra context because of (the four reasons) At the same time using the composite model of normalised indicators and the Accra CBD is not performing too well. Seen that there is no there is no fixed document, policy guidelines, or toolbox to measure pedestrian planning in the metro specifically for the CBD is alarming. Working towards this gives room for the area and the metro as a yardstick for emulation by other cities.

Moreover, looking the UMI vis-à-vis the local indicators developed shows that, there is a window of opportunity in the NTP regarding the general goals. They seem to fit what is required in the ideal scenario. However, looking at the policy document, we see that the level of operation is constantly generic.

The planning and development of pedestrian-friendly policies should be a long-term task that a city must do as part of its responsibilities. This undertaking should which include infrastructure, services, and user satisfaction. It should consider looking at the spatial and non-spatial conditions in an aggregated manner since there is an unbreakable relationship between both existing conditions. As such, the quality of the walkability produced in the walking environment could influence the experiences of those walking.

How is the mobility wellbeing of pedestrians determined?

What people think of their environment speaks much on how they experience it, how it influences their daily life and their expectations from it. The objective of this SRQ was to ascertain the mobility wellbeing of pedestrians. Wellbeing and mobility have been studied by various scholars (Harmer et al., 2019; Hidayati et al., 2021; Nordbakke & Schwanen, 2014). In this research I approached mobility wellbeing in terms of safety, comfort, and convenience.

Understanding the mobility wellbeing of pedestrians on Accra CBD, brought to light main keywords that pedestrians feel is paramount to their experiences of the walking environment. It was expected that findings will highlight several considerations on safety in Accra CBD since most research focus on that. However, it appears that the considerations are merely words but not actions. Established from conceptual framework (see 2.0) and evaluation of optimal spatial and non-spatial conditions (see 5.1) one can see what is optimal for safety, comfort and convenience in the walking environment. However, there an apparent difference between what people perceive as the ideal safe, comfortable and convenient walking environment based on their understanding of wellbeing.

I argue that mobility wellbeing goes beyond safety. For the pedestrian, mobility wellbeing can be seen as is a collage of the understanding, experiences, realisations and perceptions of the satisfaction of walking environment via safety comfort and convenience.

Finally, the question of how mobility is determined, is answered by identifying how the users of the walking environment experience it and how they feel about it. This has been sufficiently answered in this research. Although perceptions are highly subjective and may not be generalised, it already informs on the individual and collective reality of pedestrians in Accra CBD area. There could be an exploration on how pedestrians revere these elements separately. However, the researcher is strongly of the view that such insight might not be yield substantive results. Rather, the proposed concept would need further conceptualisation to address the possible disparities it addresses (or not) – for whom is mobility wellbeing considered.

This research has highlighted the spatial and non-spatial conditions in the walking, the performance the conditions yield, how they are represented in the planning process and how they could better reflect ideal situations. The understanding of these aspects helps to address the experiences, and ultimately the mobility wellbeing of people in the walking environment. One way of addressing this would be to put users at the forefront of initiatives that concern them. Thuswise, it is possible to use attract pedestrians to a more walkable environment that contribute to their mobility wellbeing. Drawing from the realisations of pedestrian's perception of ideal environment, this could inform authorities to be in line with the need to supply what is necessary.

> *"…There are instances where they are abandoned because the pedestrians normally want to cross the road at a particular place and not where it's been positioned."* (EXP04)

In a situation like this, if the considerations of the users are made paramount, situations of resistance, and ill-use of infrastructure can be avoided.

Answering the main question

With the main research question *How do the spatial and non-spatial conditions in the walking environment affect walkability in Accra to influence the perceived mobility wellbeing of pedestrians?*, this research has been able to highlight the conditions in the walking environment further identifying the impact of the performance on the quality of walkability. Using the composite analysis of existing conditions concerning best practices such as the Urban Mobility Indicators (UMI) gives an impression of what needs to be improved in the walking environment to improve pedestrians. This could conceivably already suggest an actionable method to improve pedestrian planning in the metropolis. As it is, the potential spatial and non-spatial conditions, with normalised aggregation of indicators, give an understanding of what is happening and what could be tackled.

This research shows that existing studies on walkability have not yet put the mobility wellbeing of pedestrians at the centre of consideration. The focus has been on the 'quality of the environment' for so long that it is an easily adapted definition for walkability. With the wealth of findings drawn from this study, we can realise that the quality is only one part. Identifying and understanding the performance of the existing conditions in the walking environment informs the quality of walkability that the environment provides.

The performance theory contributes to this assessment by providing the guide to understanding that for a plan to be functional, it must serve the purpose for which it is developed. What exists in between looking at the performance to inform the quality of walkability through the traversability, physical enticement and compactness is the assessment of key planning and policy document. It generally informs on the understanding that what exists in the walking environment is as a result of a non-functional planning process and implementation. Which consequently contributes as what is seen in the quality of walkability with the performance of the walking environment.

Drawing from the conceptual framework that this research is built on, the performance and quality dynamics ultimately influence mobility wellbeing. This is also not enough until the pedestrian expresses their perceptions of the performance and quality of the environment as the perceived mobility wellbeing.

Having made clear, the relationship between the walking environment (with its conditions), the walkability and the perceived mobility wellbeing. It is now necessary for further studies to zoom in on conceptualising fully the mobility wellbeing of pedestrians considering highly on the role of urban health planning in defining and determining mobility wellbeing. This can greatly impact the sustaining living in cities to improve the quality of life of people.

Knowing what this research suggests, it informs on relevant contribution for the society and for academia. First, for the society, the outcome from this study it hints heavily on a need to improve policies and plans for pedestrian transport. Before hand, there has not been evaluation on the pedestrian infrastructure and user satisfaction in the local Ghanaian.

Second, for academic and scientific grounds this research has provided grounds for understanding walkability and mobility wellbeing in the Ghanaian context. By highlighting the essential relationships amongst the walking environment, walkability and perceived mobility wellbeing in a conceptual framework (see *Figure 3).* Also, by providing a systematic means of assessing the performance of the walking environment (see 5.1.1). This assessment contributes a normalised understanding of the walking environment, walkability, and the influence on perceived mobility wellbeing. Based on this contribution, perhaps refinements could be made on Forsyth's (2015) framework on walkability to consider mobility wellbeing as the fourth block for outcomes on walkability.

7.2 Limitations

This research, like many scientific studies, had a few limitations. Primarily, conducting this research in proxy, there was a chance of missing out on the reactions of participants as they share their experiences and knowledge on the study content. However, this was sorted by having recorded conversations of the interviews with researcher updated on the progress periodically online. For on field observations, the researcher compensated by verifying via Google Street view to add the necessary information missing on Open-Source Dataset. Where street view inaccessible, observations were made using educated guesses where the streets was unavailable for certain streets. This process should however be complemented with on-field verifications and validation of the open-source data since the Street view data is outdated in -2016,2017 for future studies.

Moreover, access to key documents was easy. Information on key policy documents and projects are not well publicised, hence the reliability was most often questionable. Hence the researcher resorted to one key policy document – the National Transport Policy (2020), whose reliability was confirmed by expert interviews.

Again, interviews with pedestrians were a hassle for reasons of time, unresponsiveness, and mistrust. made respondents uncomfortable. They did not trust my presence as an 'external' person. Another limitation here was due to the setting of the interviews (in Accra Central). With many activities going on, it was difficult to get pedestrians to wait for more than ten minutes. Therefore, some respondents who had little patience could respond to fewer questions than normal.

Finally, by conducting this case study focusing solely on the Accra CBD as the case study restricts the generalisability of the findings to other places (see 3.7.3). Due to the local characteristics of the Accra CBD, it would be difficult to generalise the findings for other parts of the city and even beyond. However, as this study forms a part of telling a larger story on influence of walkability on mobility wellbeing in the Ghanaian context, it forms a building block for deeper studies. The findings and recommendation that can be emulated by other cities and towns on regional and national level.

7.3 Recommendations

(For urban planners and designers)

Though this research promised to propose a framework for pedestrian planning, it was not fully actualised. This results from realisations of deep-rooted planning and policy formulation issues. Therefore, the planning authority must have a thorough house cleaning exercise. Doing this would require an overhaul of the urban mobility planning system, especially walking in the metropolitan area. Beginning from the root, set out a specific system for pedestrian planning. After that, consider a scale-level policies and strategies framework for pedestrians. I propose this on two levels specifically targeted at the regional and local level for planners and for designers (*see Table 9*)

Taking the transdisciplinary shift in tackling pedestrian planning and policy formulation will bring all stakeholders on board in solving the pedestrian issues in the Accra Metropolitan Assembly. This can be emulated by other districts in the country as well. This approach will be to consider better collaboration options in place of decorated consultations.

Furthermore, the initiating the walkable city initiative in Accra will steer the pedestrian planning in the right direction. A 'Walkable Accra Initiative' by the metropolis will show the seriousness of planning authorities and citizens towards improving the mobility and wellbeing of pedestrians in Accra. It begins with all parties identifying that the underlying issue has gone beyond the provision of infrastructure. Not considering just the infrastructure and pedestrian space as an extension of the carriageways but with the experiences catering to the pedestrians' safety, comfort, and convenience, there is the need to consider enforcement and behavioural change. This can only be achieved through an all-hands-on- board initiative.

(For Further Research)

For further research, there could be a comprehensive conceptualisation of mobility wellbeing as a novel concept. An in-depth investigation of mobility wellbeing with proposed indicators of safety, comfort and convenience could be done to test its relevance for various vulnerable groups in society. Since there has been an urgent call for sustainable and liveable cities, this could form a basis to address the SDGs 11 Sustainable Cities and Communities and 3 Good Health and Wellbeing UNGA (2015).

Also, it will be interesting to study the dynamics of urban form and urban health planning with simulations of cognitive use of the urban environment by pedestrians. A more psychogeographical -spatial analysis with cognitive modelling can be carried out to understand the relationship between the pedestrian and their environment fully.

Finally, as a consideration for defining walkability, perhaps mobility wellbeing could be the missing fourth arm of Forsyth's (2015) framework of walkability outcomes. Like the outcomes for promoting walkability by Forsyth (2015), mobility wellbeing equally fits the description as an 'outcome' element for promoting walkability.

Table 9 Recommendations for urban planning and design experts

What is recommended	***Who's responsible***	***What Actions (How)***	***Comments***
(Planning**)**			
Systematic evaluation and monitoring of walking conditions	Transport planning office LUSPA Ministries of Roads and Highways	Conduct city-wide auditing specific landmarked areas for pedestrian facilities such as side walks	This will provide a benchmark for all other interventions seeing that data would be readily available to inform
Sensitisation of public on use and activities in the walking environment	Traditional leaders, Ghana Highway Authorities, National Road Safety Authorities, and the Accra Metropolitan Assembly	Provide workshops to all road users on pedestrian friendly environments	It is not certain how much people are willing to change their ways based on the intervention on traditional leaders especially in cities.
(Designing the space**)**			
More green spaces (including shade trees) within the CBD; along pedestrian paths	LUSPA Parks and Garden Ministry of Roads and Highways	Collaboration amongst three entities under the Ministry of Local Government (*see Figure 11*). This means that they are not so distant in operation.	It will be relatively easy to amass funding against other solo projects for from the ministry towards this course. Pulling this from the under the same umbrella ministry will yield a greater force of support for implementation
Providing and creating space for sustainable alternatives for informal markets	LUSPA Local groups such as the Market Queens	Provide collapsible structures to support unregulated commerce. The dispensation and regulation of these alternative should be left to market Queen mothers[9]	It will help embrace the informality of street use as it contributes to the livelihood. Liaising with market Queens will strengthen public interest in this alternative

[9] They are commodity leaders responsible for the specific foodstuff sold in the market. Example, there is the queen of tomatoes sellers, potatoes and fish amongst other.

CHAPTER 8

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Source: https://www.instagram.com/p/CE5dagRhVUp/

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Source: https://bit.ly/3NQZIY8

CHAPTER 9

APPENDICES

Appendix 1 – Discourse Analysis

DA01

Title	Exposed underground chambers pose threat to pedestrians
Organization	Ghana Broadcasting Corporations (GBC) Online
Source/URL	https://www.gbcghanaonline.com/general/exposed-underground-chambers-pose-threat-to-pedestrians/2021/?fbclid=IwAR2gkDUMBtmbGpXWVp6rYULC9PqNXWnAoSjOWCSPOuUSYa-dGVOeVMizxVE created on 22/04/2021
Reference	Ghana Broadcasting Corporation (GBC) (2021) Exposed underground chambers pose threat to pedestrians. Available via: https://www.gbcghanaonline.com/general/exposed-underground-chambers-pose-threat-to-pedestrians/2021/?fbclid=IwAR2gkDUMBtmbGpXWVp6rYULC9PqNXWnAoSjOWCSPOuUSYa-dGVOeVMizxVE [Last accessed on 30/11/2021].
Context	News publication on pedestrian safety on roads
Keywords	Pedestrian walkways, fatal, death traps

Text	**Analysis**
"A number of pedestrian walkways in parts of the capital have become death traps. Numerous underground chambers or manholes constructed as conduits for sewerage and cables have all been exposed following the removal of the metal covers. *Along parts of the Liberation Road in Accra, GBC News found out that these gaping holes were too deep and could be fatal, should one miss his or her step. The situation has persisted for years with careless abandon".*	***What is this discourse doing? What/whom is it intended for?*** "death traps" It is calling out the dangers and obstructions that pedestrians are exposed to on the walking path ***How is it constructed? How did this happen? (And by whom? To whom?)*** As a description of the current state of some pedestrian walkways in Accra, Ghana. Also pointing out that the situation has been ignored for a while ***What resources were available to perform this discourse?*** National broadcasting corporation, a news platform in Ghana ***What spatial condition(s) identified****?* Path quality (exposed conduits, manholes etc.)

DA02

Document title	Tetteh Quarshie Footbridge Opens to Pedestrians
Organization	Peace Fm
Source/URL	https://www.peacefmonline.com/pages/local/news/201509/252775.php created on
Reference	Peace Fm Online (2015). Tetteh Quarshie Footbridge Opens to Pedestrians. Available via: https://www.peacefmonline.com/pages/local/news/201509/252775.php [Last accessed on 30/11/2021]
Context	News publication on new pedestrian infrastructure (footbridge) in Accra, Ghana
Keywords	Crossing, footbridges, median

Text	**Analysis**
"Prior to the construction of the bridge, a number of pedestrians lost their lives while trying to cross the road. ***To prevent the situation where pedestrians cross the highways instead of using the footbridges, railings have been erected in the median of the road".***	***What is this discourse doing? What/whom is it intended for?*** "lost their lives" It is calling the attention of the authorities on the need to increase the safety of pedestrians. It is directed at the government ***How is it constructed? How did this happen? (And by whom? To whom?)*** It comes across as an advice or caution. The new pedestrian infrastructure will help curb pedestrian facilities. This mean that a lack of it was previous a problem. This is reported by news article author. ***What resources were available to perform this discourse?*** This is an independently funded corporation. News reportages are sponsored by self or other private commercial entities ***What spatial condition(s) identified****?* Traffic safety for pedestrians Missing crossing facilities

DA3

Document title	Zebras 'Eat' Pedestrians
Organization	Peace Fm
Source/URL	https://www.peacefmonline.com/pages/local/education/201909/390479.php
Reference	Peace Fm Online (2019). Zebras 'Eat' Pedestrians. Available via: https://www.peacefmonline.com/pages/local/education/201909/390479.php [Last accessed on 01/12/2021].
Context	News publication on the zebra crossings in Ghana
Keywords	Zebra crossing, priority, safe

Text	**Analysis**
"All over the world, if there are any portions on stretches of roads that are safe for pedestrians to cross those roads, they are the zebra crossings. *However, in Ghana, those crossings have become precarious havens, giving no assurance to road users who want to get to the other side of roads safely and legally.* *Although the alternating black and white stripes on the road surface resembling the coat of a zebra are expected to give priority to pedestrians, in Ghana drivers and other motorists blatantly ignore the rights of pedestrians once they step out onto the black and white lines on the road, a situation that often ends in accidents".*	***What is this discourse doing? What/whom is it intended for?*** The text is reporting the fact that pedestrians are unsafe at pedestrian crossing. It is not quite clear whom the intended audience is. ***How is it constructed? How did this happen? (And by whom? To whom?)*** ***"****Precarious havens"* It is constructed to mean that zebra crossings are rather dangerous than they are designed to be a safe place for pedestrians ***What resources were available to perform this discourse?*** This is an independently funded corporation. News reportages are sponsored by self or other private commercial entities ***What spatial condition is identified****?* Pedestrian safety on crosswalks Path continuity

Title	N.A
Organization	Twitter
Source/URL	https://twitter.com/KafuiDey/status/967854102884515841
Reference	Dey, K. [@kafuidey]. (2018, February 25). *#Ghana's Road Safety Commission needs to step up their messaging on pedestrian visibility. Drove 50km from Afienya to Accra and…* [Tweet]. Twitter. https://twitter.com/KafuiDey/status/967854102884515841 [Last accessed on 01/12/2021]
Context	A personal tweet by a Ghanaian journalist
Keywords	Visibility, brighter clothes

Text	**Analysis**
"#Ghana's Road Safety Commission needs to step up their messaging on pedestrian visibility. Drove 50km from Afienya to Accra and everywhere I could barely see the pedestrians on the roads. All they need to do is wear brighter clothing to increase their chances of staying alive!"	***What is this discourse doing? What/whom is it intended for?*** It is calling to the attention of the authorities to improve the safety of pedestrians. It could mean there is inadequate lighting along the roads, or not a clear separation on the roads for pedestrians. ***How is it constructed? How did this happen? (And by whom? To whom?)*** As an advice to the authorities to work on making pedestrians more visible to motorists to be safe. ***What resources were available to perform this discourse?*** A verified personal twitter account ***What walkability condition(s) identified****?* Poor lighting (visibility), quality of path Personal/ Traffic safety

DA04

Title	N. A
Organization	N. A
Source/URL	https://twitter.com/Amegaxi/status/615411713966477312
Reference	Sol, I [@amegaxi]. (2015, June 29). *Empty Coconut shells are Accra's new favorite litter item and pedestrian walkway are the new dump site for everything. It's…* [Tweet]. Twitter. https://twitter.com/Amegaxi/status/615411713966477312 [Last accessed on 20/04/2022]
Context	A personal tweet on the cleanliness of the pedestrian walkways in Accra city
Keywords	Litter, pedestrian walkway, dump site

Text	**Analysis**
"Empty Coconut shells are Accra's new favorite litter item and pedestrian walkway are the new dump site for everything. *It's nasty #CitiCBS"*	***What is this discourse doing? What/whom is it intended for?*** It is describing the quality of pedestrian environment ***How is it constructed? How did this happen? (And by whom? To whom?)*** *"new dump site"* It is constructed as a new dump site meaning that the walkways are mostly covered with trash, specifically coconut shells. ***What resources were available to perform this discourse?*** A personal verified twitter account of a social activist ***What spatial condition(s) identified****?* The quality of the pedestrian path; the cleanliness and lack of maintenance

DA05

Title	A personal tweet about rubbish heaped on pedestrian walkways
Organization	Twitter
Source/URL	https://twitter.com/Amegaxi/status/615414311377371136
Reference	Sol, I. [@amegaxi]. (2015, June 29). *The pedestrian walkways have so much rubbish heaped on them that sometimes you have to walk into the road. It's…* [Tweet]. Twitter. https://twitter.com/Amegaxi/status/615414311377371136 [Last accessed on 20/04/2022]
Context	Tweet
Keywords	Pedestrian walkway, dangerous, rubbish

Text	**Analysis**
"The pedestrian walkways have so much rubbish heaped on them that sometimes you have to walk into the road. It's nasty and dangerous #CitiCBS"	***What is this discourse doing? What/whom is it intended for?*** It is describing the quality of pedestrian walkways that forces pedestrian to endanger themselves by walking unto roads. ***How is it constructed? How did this happen? (And by whom? To whom?)*** *"dangerous and nasty"* It is constructed as a to mean that as the rubbish takes over the walkways, pedestrians are forced to walk on the road – posing a dangerous situation for them. In other sense it is nasty to see the amount of rubbish and whatever the constituents are on the walkways. ***What resources were available to perform this discourse?*** A personal twitter account tagging a private news corporation in the hashtag. Contributing to discussion on the hashtag promoted by the private news corporation ***What walkability condition(s) identified****?* Path quality

DA06

Title	A personal tweet by a person living in Accra on the current conditions of the street furniture available
Organization	Twitter
Source/URL	https://twitter.com/Amegaxi/status/738645531472318464
Reference	Sol, I. [@amegaxi]. (2016, June 3). *The base of traffic lights and road signs on pedestrian walkways is now the official rubbish dumping spot all over…* [Tweet]. Twitter. https://twitter.com/Amegaxi/status/738645531472318464 [Last accessed on 20/04/2022]
Context	A tweet about the general cleanliness of the pedestrian walkways in Accra
Keywords	Pedestrian walkways, road signs

Text	**Analysis**
"The base of traffic lights and road signs on pedestrian walkways is now the official rubbish dumping spot all over Accra #CitiCBS"	***What is this discourse doing? What/whom is it intended for?*** It is describing the state of pedestrian infrastructure in the city ***How is it constructed? How did this happen? (And by whom? To whom?)*** To inform audience (sarcastically) of the current rubbish dump site. ***What resources were available to perform this discourse?*** A personal verified twitter account of a social activist (non-sponsored) ***What walkability condition(s) identified****?* Path quality and maintenance, safety (personal/traffic)

Title	N.A
Organization	N.A
Source/URL	https://twitter.com/ansaah_akua/status/1451616359020957696
Reference	Tee [@ansaah_akua]. (2021, October 22). *One of the worst things about being a pedestrian in Accra is that the roads are so bad sometimes the …* [Tweet]. Twitter. https://twitter.com/ansaah_akua/status/1451616359020957696 [Last accessed on 20/04/2022]
Context	A personal tweet by a resident of Accra on the traffic safety of pedestrian walkways
Keywords	Competing, pedestrian walkways

Text	**Analysis**
"One of the worst things about being a pedestrian in Accra is that the roads are so bad sometimes the drivers are competing with you for the edge of the road and pedestrian walkways".	***What is this discourse doing? What/whom is it intended for?*** It is implying that the pedestrians are at a risk because the space allocated to them is easily invaded by drivers. ***How is it constructed? How did this happen? (And by whom? To whom?*** It is constructed as drivers competing with pedestrians on the roads. This implies a concern for the traffic safety of pedestrians on walkways. ***What resources were available to perform this discourse?*** A personal twitter account ***What walkability condition(s) identified****?* Buffer distance between motor traffic and pedestrian walkway

DA07

DA08

Title	N.A
Organization	N.A
Source/URL	https://twitter.com/illegalLuminary/status/1450012155047153664 created on 18/10/2021
Reference	Luminary, I. [@illegalluminary]. (2021, October 18). *The traffic situation in Accra may not improve much; hawkers are quick to take over parking stations, parking lots, pedestrian…* [Tweet]. https://twitter.com/illegalLuminary/status/1450012155047153664 [Last accessed on 01/12/2021]
Context	A personal tweet by a resident of Accra on the loitering situation of hawkers on the streets
Keywords	Hawkers, pedestrian crossing, encroach

Text	**Analysis**
"The traffic situation in Accra may not improve much; hawkers are quick to take over parking stations, parking lots, pedestrian crossings and even encroach on the streets this forcing vehicles to share space with the public. It is a management problem not just infrastructural".	***What is this discourse doing? What/whom is it intended for?*** It is explaining why the traffic situation in Accra is as it is. It further states the issue is because of poor management of the pedestrian space ***How is it constructed? How did this happen? (And by whom? To whom?)*** It is constructed as hawkers encroaching on the pedestrian space by a resident in Accra ***What resources were available to perform this discourse?*** A personal non sponsored twitter account of a resident in Accra ***What walkability condition(s) identified****?* Encroachment of pedestrian space Buffer distance between pedestrians and cars

DA9

Title	N.A
Organization	N.A
Source/URL	https://twitter.com/eddynarm/status/1243791287645605889
Reference	Dexter [@eddynarm]. (2020, March 28). *Maaad rush at Accra central. Wheeeew! There was traffic as at 4:30am. Human traffic is worst. Queues at ATM's…*[Tweet]. Available via https://twitter.com/eddynarm/status/1243791287645605889 [Last accessed on 01/12/2021]
Context	A personal twitter by a resident of Accra on the personal safety of pedestrians during rush hours
Keyword	Traffic, pick pockets, pedestrian walkway

Text	**Analysis**
"Maaad rush at Accra central. Wheeeew! There was traffic as at 4:30am. Human traffic is worst. Queues at ATM's and MoMo vendors. Pick pockets on the alert. Okada's riding through pedestrian walkways. Safety measures basically ignored. Let's be cautious out there".	***What is this discourse doing? What/whom is it intended for?*** It is talking about the personal safety of pedestrians in the city during the rush hour. ***How is it constructed? How did this happen? (And by whom? To whom?)*** It is constructed as a caution to pedestrians to be aware of their personal safety. ***What resources were available to perform this discourse?*** A personal twitter account ***What walkability condition(s) identified****?* Personal safety of pedestrians

DA11

Title	Would I be saving my life if I use the Pedestrian Bridge?
Organization	LinkedIn
Source/URL	https://www.linkedin.com/pulse/would-i-saving-my-life-use-pedestrian-bridge-ellsamwise-king-dogbe/?trackingId=Y9YQZGuKSfea1mir4FOLRA%3D%3D created on 05/05/2016
Reference	EllSamwise King. (2016, May 5). *Would I be saving my life if I use the Pedestrian Bridge?* [Thumbnail with link attached] [Post]. LinkedIn. https://www.linkedin.com/pulse/would-i-saving-my-life-use-pedestrian-bridge-ellsamwise-king-dogbe/?trackingId=Y9YQZGuKSfea1mir4FOLRA%3D%3D [Last accessed on 01/12/2021]
Keywords	Pedestrians, inconvenience, bridge, walking, crossing
Context	An interview with a resident in a blogpost on why pedestrians do not use pedestrian bridges

Text	**Analysis**
"Have you seen those standing there, they will cross right now, look! They are crossing, they don't fear the cars," says 25 year old Mari, a petty trader who sells along the newly-constructed 14-km N1 Highway at Old Achimota. *"They cross here every morning, the old, young, women, men and children, cross the Highway, just look at them," Mari says. "I will not risk my life like that."* *Pedestrians claim it is faster to cross Highways when cars are far off than having to walk about a kilometer to the pedestrian bridge. Also, some pedestrian bridges are usually far apart, and most pedestrians will not voluntarily accept the added inconvenience of walking ten or twenty minutes out of their way just to get to a pedestrian bridge, and instead will dash across the Highway at the nearest convenient location.*	***What is this discourse doing? What/whom is it intended for?*** The discourse is referring to pedestrian safety with oncoming traffic ***How is it constructed? How did this happen? (And by whom? To whom?)*** As concern by an interviewee who is an inhabitant of Accra. ***What resources were available to perform this discourse?*** A blog platform possible promoted a sponsor, ADK Consortium. A general survey by the news corporation, inviting inhabitants to share their thoughts on pedestrian safety on highways ***What walkability condition(s) identified****?* Path connectivity

Appendix 2 - Expert List

	Code	Role	Office	Date of interview
1	EXP01	Engineer	Policy Planning and Budget Directorate, Ministry of Roads and Highways, Ghana	06/05/2022
2	EXP02	Assistant Development Planning Officer	Accra Metropolitan Assembly, Ghana	13/05/2022
3	EXP03	Deputy Director, Head of Public Investment Unit	Ministry of Transport, Ghana	17/05/2022
4	EXP04	Civil engineer, Transport Planning Officer (*formerly*)	Department of Urban Roads, Ghana	23/05/2022

Appendix 3 – Experts interview protocol

Information sheet

Thank you for being a participant in this study. This information sheet explains what the study is about and how we would like you to participate.

This study explores walkability conditions in the walking environment and the potentials for the perceived mobility well-being in the Accra CBD area.

Your expert opinions and insights are instrumental to the success of this research. Thus, I would like you to be interviewed to elicit your views. For this to occur, I would need your consent to carry on. The interview will be conducted online for an hour and recorded if you agree to this.

Be rest assured that the study is conducted with the regulations of the ethics committee at the Wageningen University and Research. The information provided by you during the interview will be used for research and academic purposes. Your details will be held confidential and anonymous.

Thank you!

Informed Consent

I have read and understood the content and context of this research of this study.

I have been allowed to ask questions about the study

I understand that being a participant in this study, I agree to be recorded

I understand that my personal details and recordings of the interview will be used only for this and no other external purpose

I understand that I can withdraw from being a part of this study at any time and stage during the interview.

Participant _____

Researcher _____

Place _____

Date/Time _____

Introduction

This interview is structured in 2 parts, and it will last for an hour. For the first part, you are invited to answer questions related to pedestrian planning and policymaking in Accra, Ghana. The second part ushers you into a more interactive session; you will be asked to provide your professional (expert) insights on analytical maps.

Part A

Kindly state your name and your specialisation/office.

1. In your field of expertise, how do you define the pedestrian planning situation in Accra?
   Probe: What role do you play in pedestrian planning and design and policymaking processes in Accra, Ghana

2. In transport and mobility policy documents available online like the *Sustainable Mobility and Accessibility Policy in Urban Areas – December 2018, Ghana NMT Strategy 2019-2028, Pedestrian Road Safety Plan for the Accra Metropolitan Assembly 2018-2022,* little or no reference is made to pedestrian planning as a separate entity in terms of infrastructure and policies. What is your comment on this?

3. To what extent do the planning and policies concerning mobility consider the user perspective regarding pedestrian satisfaction.

4. Can you provide indicators that you are aware of that are paramount in planning and designing the pedestrian environment?
   Probe: How are these indicators actualised? And what barriers prevent these indicators from being actualised (if they are not in place)

5. Broadly, literature and theories refer to Traversability, Physical enticement, Compactness and safety in pedestrian planning and walkability. Are these familiar concepts to you?
   Probe: *What aspects of traversability, physical enticement, compactness and safety are considered in current pedestrian planning?*

6. What would you say contribute to Accra's current walkability (spatial and non-spatial) conditions?
   Probe: *Does the behaviour of pedestrians play a role in the current situation?*
   Probe: Are there any prospects of encouraging collaborative planning or participation in improving the pedestrian situation?

Part B

The following are analytical maps[10] created from an open source dataset and field verification (via Google maps).

A. Traversability
B. Physical enticement
C. Compactness

Traversability

Ease of access

Compactness

Density of the built environment

Physical enticement

Attractiveness of the environment

[10] Experts were shown series of combinations of maps in Appendix X

Appendix 4 – Pedestrian interview protocol

Investigating the perceived mobility wellbeing of pedestrians in the Accra CBD area

This interview forms an integral part of a master research thesis at Wageningen University and Research, the Netherlands, on "*Exploring walkability conditions in the walking environment and the potentials for perceived mobility wellbeing of pedestrians in Accra, Ghana*". You are invited to partake in this interview to share you experiences as a pedestrian in Accra CBD area.

If you agree to this interview, I will need your explicit consent to proceed. The study is conducted with the regulations of the ethics committee at the Wageningen University and Research. The information provided by you during the interview will be used for research and academic purposes only. Your details will be held confidentially and made anonymous.

Thank you for your consideration!

With regards, Mercy

* Required

Informed consent

1

Please indicate below your response

☐ I have read and understood the content and context of this research of this study.

☐ I agree to the interview being recorded and the recording will be transcribed and kept anonymously.

☐

☐

I understand that my personal details and recordings of the interview will be used only research and academic purposes related to this study.

I understand that I can withdraw from being a part of this study at any time and at any stage during the interview.

PART 1

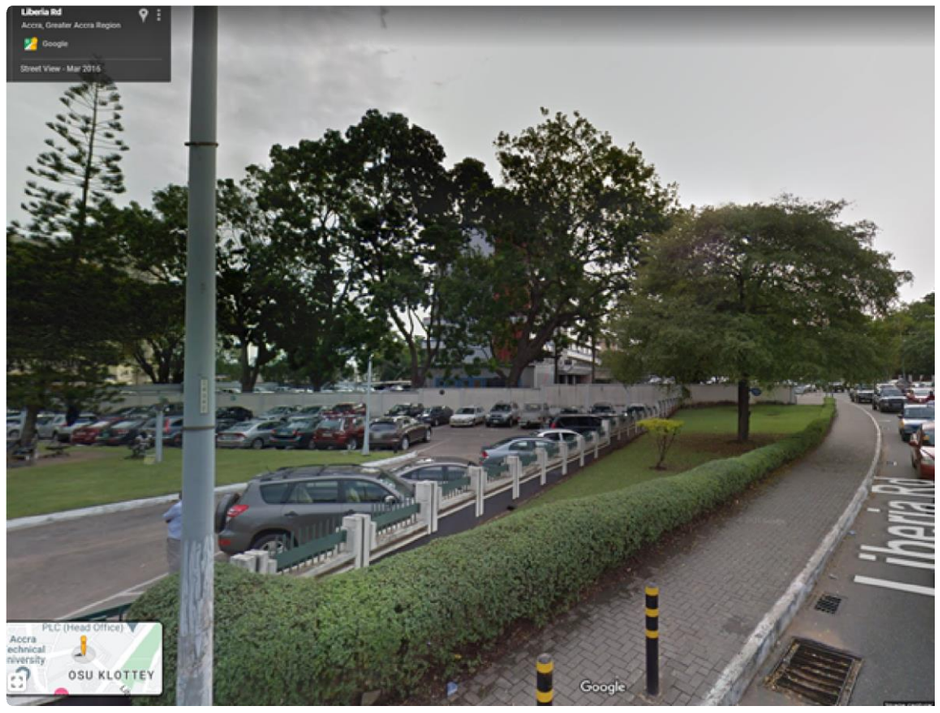
Determining mobility wellbeing

This section is in three parts -A B C. Please rate (1-5 stars) the following photos according to preference

A. Safety

2

How safe do (would) you feel walking here? *



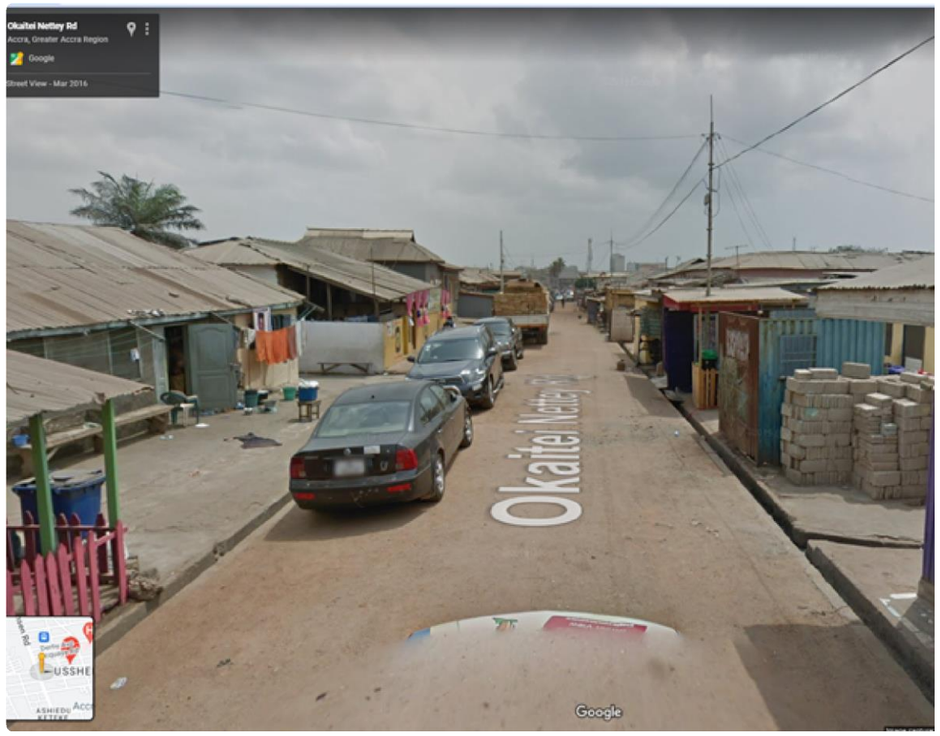
not safe ☆ ☆ ☆ ☆ ☆ safe

3

not safe ☆ ☆ ☆ ☆ ☆ safe

4

Why do you consider this photo as safe/not safe *



not safe ☆ ☆ ☆ ☆ ☆ safe

5

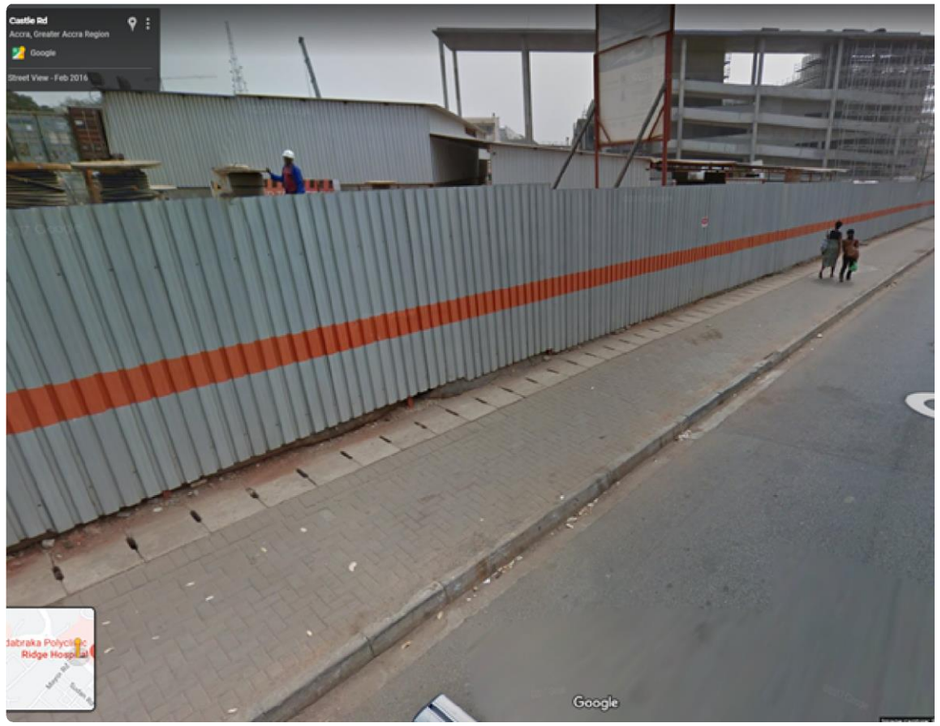
Why do you consider this photo as safe/not safe *

6

7

Why do (would) you consider this photo as safe/not safe *

8



not safe ☆ ☆ ☆ ☆ ☆ safe

9

Why do (would) you consider this photo as safe/not safe *

10

not safe ☆ ☆ ☆ ☆ ☆ safe

11

How safe do (would) you feel walking here?

Why do (would) you consider this photo as safe/not safe

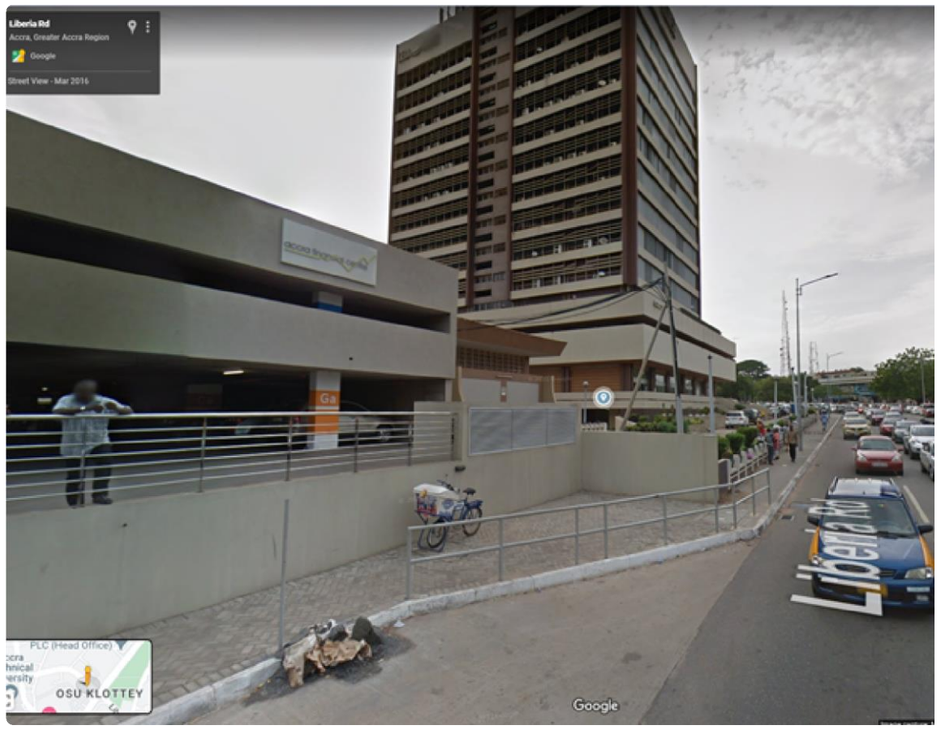
12

not safe ☆ ☆ ☆ ☆ ☆ safe

13

Why do (would) you consider this photo as safe/not safe

14



not safe ☆ ☆ ☆ ☆ ☆ safe

15

16

not safe ☆ ☆ ☆ ☆ ☆ safe

17

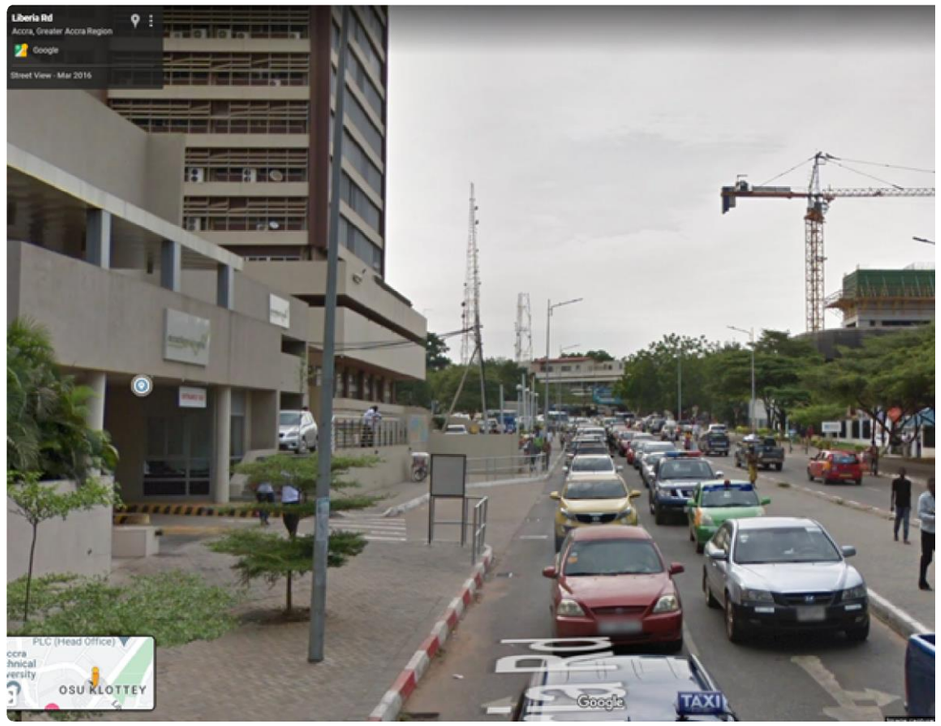
Why do (would) you consider this photo as safe/not safe

Why do (would) you consider this photo as safe/not safe

B. Comfort

18

How comfortable do (would) you feel walking here? *



not comfortable ☆ ☆ ☆ ☆ ☆ comfortable

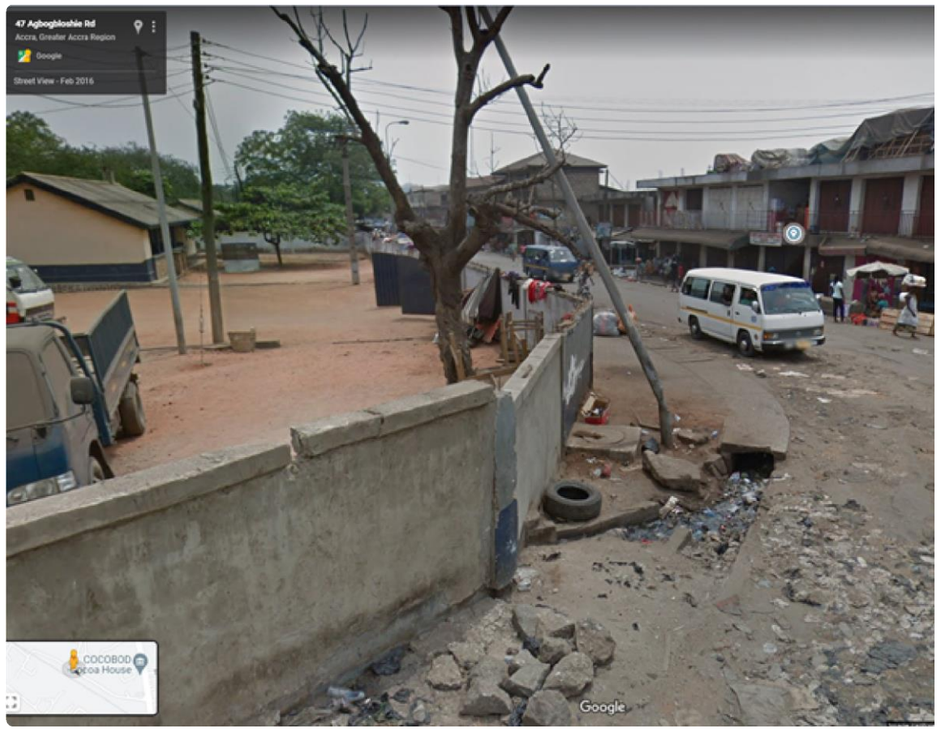
19

Why do (would) you consider this photo as comfortable/not comfortable *

20

22

How comfortable do (would) you feel walking here?



not comfortable ☆ ☆ ☆ ☆ ☆ comfortable

21

Why do (would) you consider this photo as comfortable/not comfortable *

not comfortable ☆ ☆ ☆ ☆ ☆ comfortable

23

Why do (would) you consider this photo as comfortable/not comfortable *

24

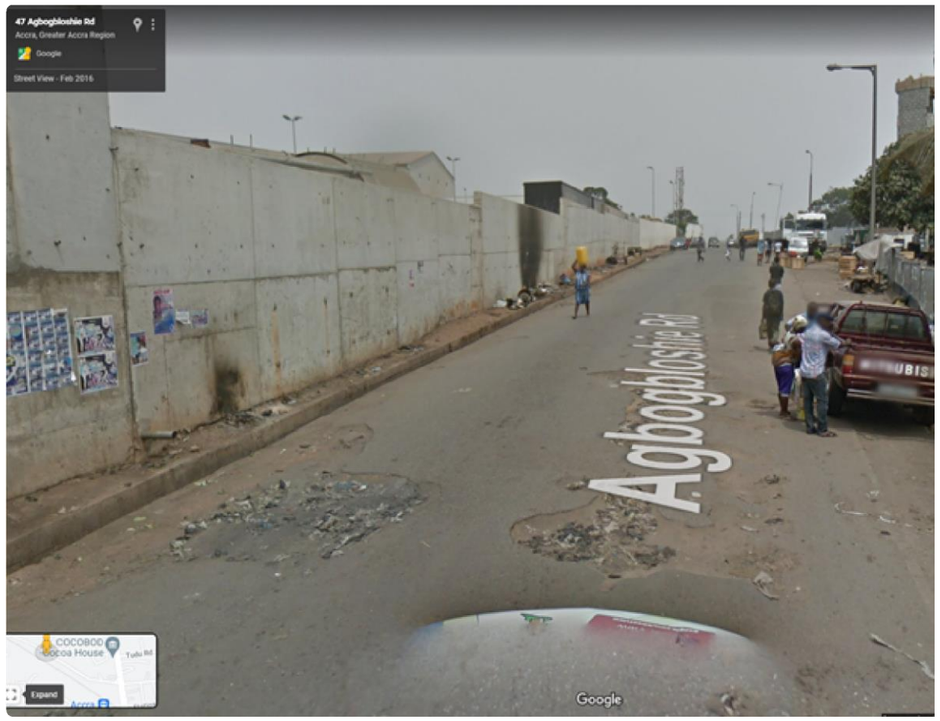
not comfortable ☆ ☆ ☆ ☆ ☆ comfortable

25

Why do (would) you consider this photo as comfortable/not comfortable *

26

How comfortable do (would) you feel walking here?



27

Why do (would) you consider this photo as comfortable/not comfortable

not comfortable ☆ ☆ ☆ ☆ ☆ comfortable

28

not comfortable ☆ ☆ ☆ ☆ ☆ comfortable

29

Why do (would) you consider this photo as comfortable/not comfortable

30

not comfortable ☆ ☆ ☆ ☆ ☆ comfortable

31

Why do (would) you consider this photo as comfortable/not comfortable

32

33

Why do (would) you consider this photo as comfortable/not comfortable

not comfortable ☆ ☆ ☆ ☆ ☆ comfortable

Convenience

34

How convenient do (would) you feel walking here? *

not convenient ☆ ☆ ☆ ☆ ☆ convenient

35

Why do (would) you consider this photo as convenient/not convenient *

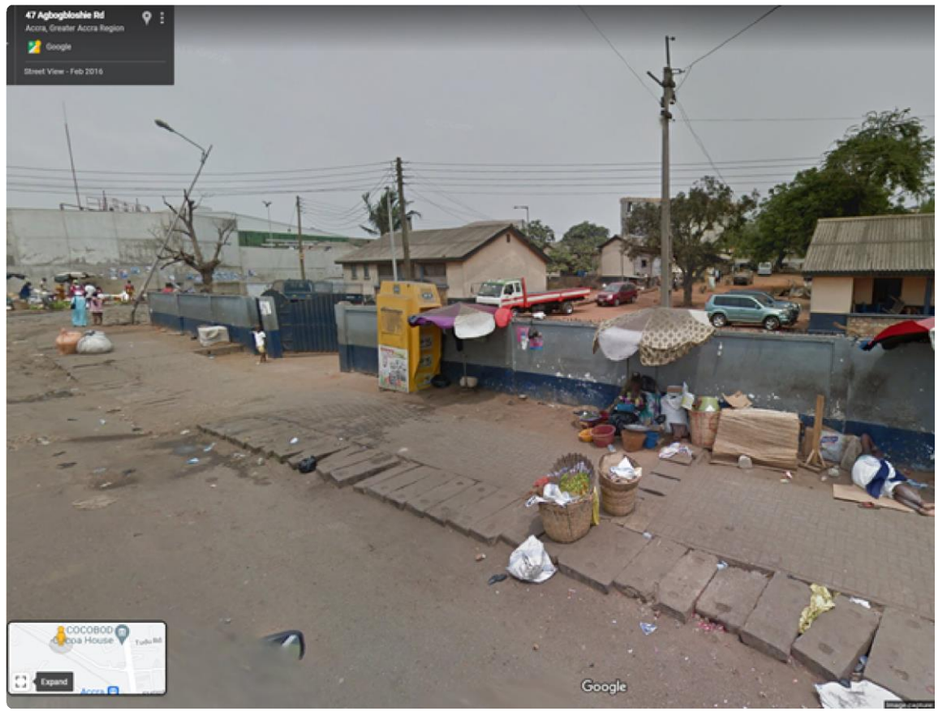
36

not convenient ☆ ☆ ☆ ☆ ☆ convenient

37

Why do (would) you consider this photo as convenient/not convenient *

38



not convenient ☆ ☆ ☆ ☆ ☆ convenient

39

Why do (would) you consider this photo as convenient/not convenient *

40

not convenient ☆ ☆ ☆ ☆ ☆ convenient

41

Why do (would) you consider this photo as convenient/not convenient

42

not convenient ☆ ☆ ☆ ☆ ☆ convenient

43

Why do (would) you consider this photo as convenient/not convenient *

44

not convenient ☆ ☆ ☆ ☆ ☆ convenient

45

Why do (would) you consider this photo as convenient/not convenient

46

not convenient ☆ ☆ ☆ ☆ ☆ convenient

47

Why do (would) you consider this photo as convenient/not convenient

48

not convenient ☆ ☆ ☆ ☆ ☆ convenient

Why do (would) you consider this photo as convenient/not convenient

PART 2

Ideal walking environment

Kindly give an impression of your ideal walking environment

50

What are some elements that you would consider having/seeing in your ideal walking environment with regards to safety? *

51

Can you share experience(s) you have had that you consider not safe for walking? *

52

What are some elements that you would consider having/seeing in your ideal walking environment with regards to comfort? *

53

Can you share experience(s) you have had that you consider not comfortable for walking? *

54

What are some elements that you would consider having/seeing in your ideal walking environment with regards to convenience? *

55

Can you share experience(s) you have had that you consider not convenient for walking? *

PART 0

Socio-demographic information

Please fill in the following information

56 Gender

- Female
- Male
- Non-binary
- Prefer not to say

57

Occupation

58

Place of residence

59

Describe your mostly used daily(trip) mode(s) of transport

60

Comments

Appendix 5 – Spatial analysis

A: Preliminary indicators with explanation and references derived from literature and media analysis

s/n	Indicators	Description/Explanation	Conditions	References
1	Pedestrian facility	Presence or absence of sidewalk, pavement, or foot path	Connectivity of path	Schlossberg et al. 2015); Lo (2009), Rigolon (2018)
2	Path accessibility	Presence or absence of lowered curbs to access the path	Connectivity of path	Southworth (2005)
3	Path materials	Presence or absence materials covering the path, e.g., asphalt, ground, gravel, concrete	Quality of path	Southworth (2005)
4	Condition of the path	Presence or absence of bumps, cracks, or potholes	Quality of path	Jaskiewicz (2000); Mateo Babiano & Ieda (2007)
5	Path obstructions	Presence or absence of obstacles or objects that reduce or block path (e.g., potholes, parked vehicles, poles, kiosks, heap of waste/sand)	Flow capacity of path	Lo (2009); Amoako et al. (2014)
6	Path completeness	Presence or Absence completeness of the path with each segment	Continuity of path	(Southworth, 2005)
7	Path Connectivity	Presence or Absence connections between the segment and other paths	Connectivity of path	(Southworth, 2005)
8	Crosswalks	Presence of crosswalks in the street segment	Safety of path	Schultz (2015); Kelly et al. (2011)
9	Condition of crosswalk	Presence or Absence visible, almost fading, not visible, no crosswalk	Safety of path	(Southworth, 2005)
10	Crossing aids	Presence or absence of crossing aids (e.g., pedestrian signals and overhead)	Safety of path	Clifton et al. (2007)
11	Traffic control	Presence or absence of traffic control devices (e.g., traffic guard, stop signs and bumps)	Safety of path	Clifton et al. (2007)
12	Speed limit	Presence or Absence of speed limit in the street segment	Flow capacity of path	Clifton et al. (2007)
13	Level of traffic/congestion	Presence or Absence of traffic volume for street segment (high/low speed traffic)	Flow capacity of path	Lo (2009); Amoako et al. (2014)
14	Street parking	Presence or absence of street parking creating buffer between walking path and moving vehicles	Quality of path	Clifton et al. (2007)
15	Buffer between buildings and sidewalks (in stories)	Presence or Absence Buffer distance between buildings (frontage) and sidewalks	Quality of path	(Jaskiewicz et al., 2000); Mateo Babiano & Ieda (2007)
16	Buffer (Pedestrian separation)	Presence or absence of buffers between road and path	Quality of path	Jaskiewicz (2000); Mateo Babiano & Ieda (2007)
17	Lighting	Presence/Absence of streetlight illuminating the road or sidewalk	Quality of path	Jaskiewicz (2000); Mateo Babiano & Ieda (2007)
18	Amenities	Presence or Absence of street amenities (e.g., Trashcan, benches, places of worship, restaurants, banks)	Quality of path	Jaskiewicz (2000); Mateo Babiano & Ieda (2007)
19	Shade trees	Presence or Absence sidewalk covered by tree canopy (shade trees)	Quality of path	Shuvo et al. (2021)
20	Green spaces along path	Presence or Absence of green spaces (green zones e.g., long strips of shrubs and grasses) along the path	Liveability of path	Shuvo et al. (2021)
21	Informal markets	Presence of informal market (commercial activities and hawkers on sidewalk (pedestrian space)	Quality of path	Jaskiewicz (2000); Mateo Babiano & Ieda (2007)
22	Cleanliness and maintenance	Overall cleanliness of walking environment and building maintenance (excluding path condition)	Quality of path	Jaskiewicz (2000); Mateo Babiano & Ieda (2007)

B: Creating walkability indicators as layers

No.	Layer	Conditions (concept)	Type of data	Connected to	Source	Status	Comments
1	Pedestrian facility	Connectivity of path	Line	Network	OSM	Completed	Added
2	Path materials	Quality of path	Line	Network	OSM	Completed	Added
3	Condition of the path	Quality of path	Line	Network	Observations	Completed	Attribute
4	Path obstructions	Flow capacity of path	Point	POIs	Observations	Completed	Added
5	Path completeness	Continuity of path	Line	Network	Observations	Completed	Added
6	Crosswalks with conditions	Safety of path	Point	POIs	OSM	Completed	Added
7	Crossing aids	Safety of path	Point	POIs	OSM	Completed	Attribute
9	Traffic control	Safety of path	Point	POIs	OSM	Completed	Added
10	Speed Limit	Flow capacity of path	Line	Network	Observations	Completed	Added
11	Street parking	Quality of path	Polygon	Object layer	Observations	Completed	Added
13	Building	Quality of path	Polygon	Object layer	OSM	Completed	Added
14	Buffer (Pedestrian separation)	Quality of path	Raster	Network	Not available	Not completed	Not added
15	Lighting	Quality of path	Point	POIs	Observations	Completed	Added
16	Amenities	Quality of path	Point	POIs	OSM	Completed	Added
17	Greenery/Shade trees	Quality of path	Point	POIs	OSM	Completed	Added
18	Green spaces along path	Liveability of path	Polygon	Object layer	OSM	Completed	Added
19	Informal commercial invasion and street hawkers	Quality of path	Point	POIs	Observations	Completed	Added
20	Cleanliness and maintenance	Quality of path	Point	POIs	Observations	Completed	Added

Appendix 6 – Maps and interpretations

Maps and interpretations

Base map

This is a base map (*Figure 37*) for the spatial analysis of the Accra CBD area. It displays all road classes in the area classified into three -Primary, Secondary and all other roads. The primary roads are major roads that are usually connected to highways from, through and to the city of Accra and other primary links. The secondary roads are roads that link the primary roads as secondary connections. Other roads are a mix of residential and service routes and footpaths and steps. The primary and secondary roads are considered major roads, whereas other roads are minor routes. The map (*Figure 37)* shows that the CBD area has more other roads that feed into the major roads. *Figure 38* shows a base map with buildings which is also an indicator measured. However, the buildings are added as base to be able to make spatial interpretations with the built environment and the implications on other indicators.

Base map

Figure 37 Base map of Accra CBD with roads

Base map

Figure 38 A map showing pedestrian facilities in Accra CBD

Pedestrian facilities (1)

Here is a map of pedestrian facilities (*Figure 39*) in the CBD area. Pedestrian facilities are a positive walkability indicator. As such, they are shown as green lines. Its presence encourages walking. It depicts where dedicated infrastructure for walking, such as pavements, sidewalks, and (unpaved) footpaths, are located. It is the most fundamental of walkability indicators. Thus, appears with all other indicators in subsequent sections. On the map, these routes are seen to extend from the centre to all ends of CBD, especially along major roads. However, there are fewer dedicated pedestrian facilities on smaller roads, like residential and service as shown on *Figure 40* below.

Pedestrian facilities

Figure 39 A map showing pedestrian facilities in Accra CBD

Pedestrian facilities

Figure 4 A map showing pedestrian facilities in Accra CBD

Path material (2)

This is a map (see *Figure 41*) showing the path materials that are present in the Accra CBD area. These are the materials that make up the path surface. This is a positive indicator for walking as the presence of a good surface support an easy movement of pedestrians. Thus, it is shown as green on the map (see *Figure 41*). These include pavements with bricks, asphalt, and concrete. In other cases, such materials may be in a deteriorated state or without a surface – ground or dirt.

From the map (*Figure 41*), it is observed that a greater proportion of the CBD is covered in asphalt, pavements or concrete. Whereas some residential roads have deteriorated asphalt, pavements or ground.

When the path materials were compared with path obstructions and crosswalks (see *Figure 42*) in the CBD, it is observed that where major obstructions are located, the path material is in a deteriorated state. They are also located where most commercial activities are found in the CBD area (See *Figure 42*)

Similarly, when path materials were juxtaposed with informal markets green spaces and shade trees (see *Figure 43*), it seen that the red regions begin to grow. Which is an indication of not encouraging walking environment. Where there are informal markets, the paths are deteriorated and not good for walking as shown in *Figure 43* below.

Path materials

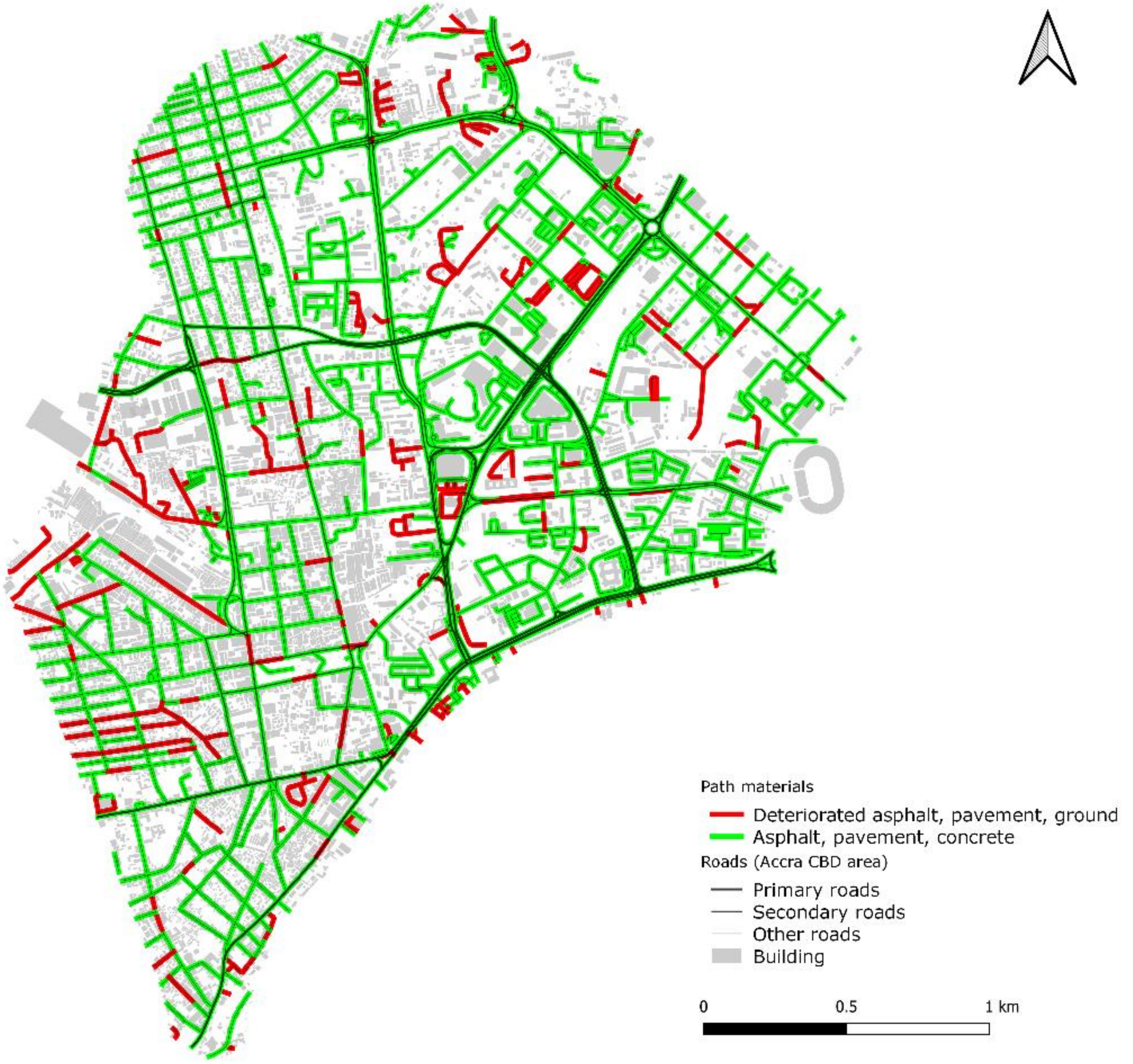


Figure 41 A map showing path materials in Accra CBD

Path materials/ Path obstructions/ Crosswalks / Street parking

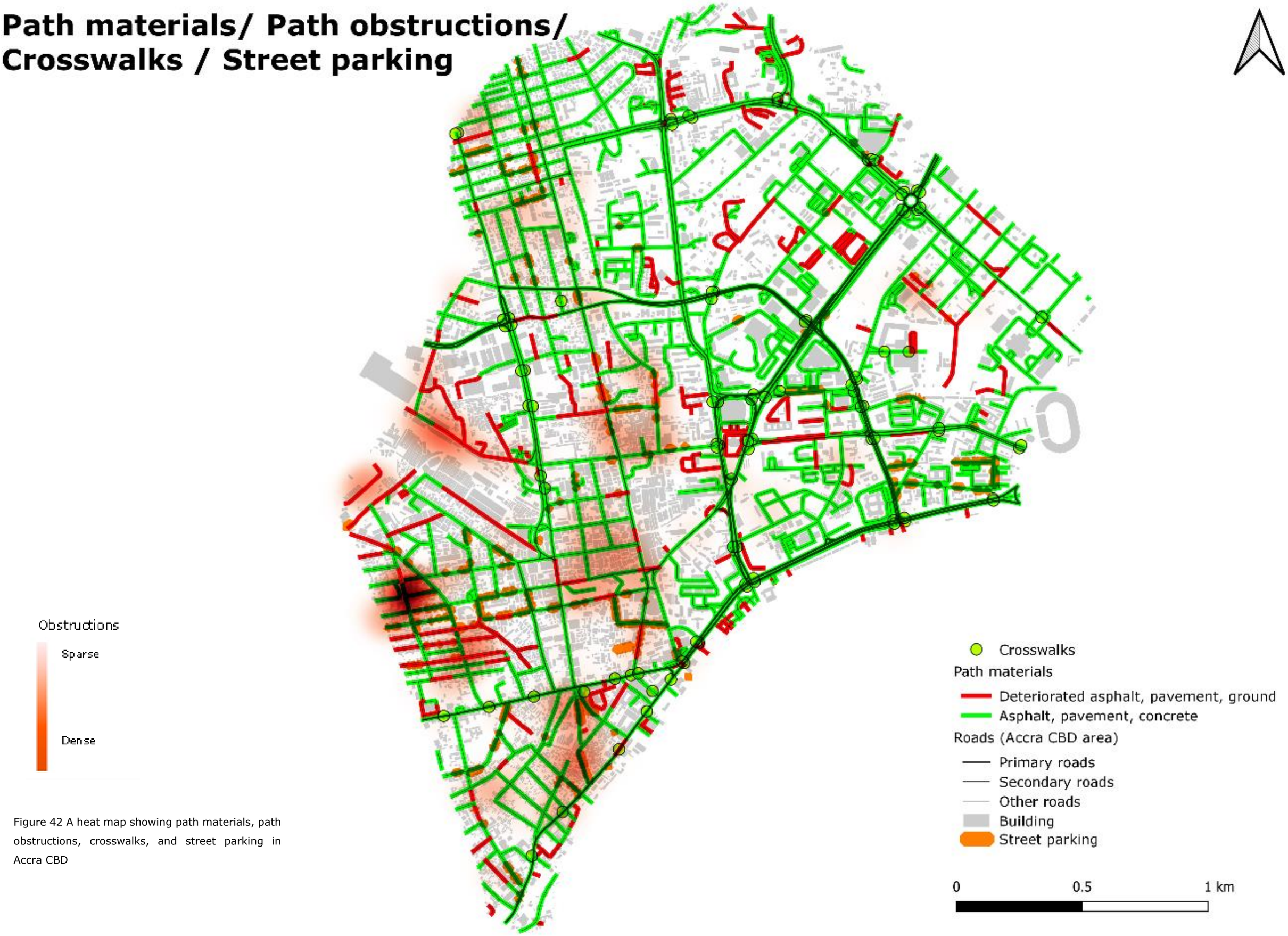


Figure 42 A heat map showing path materials, path obstructions, crosswalks, and street parking in Accra CBD

Path materials / Informal markets
Green spaces / Shade trees

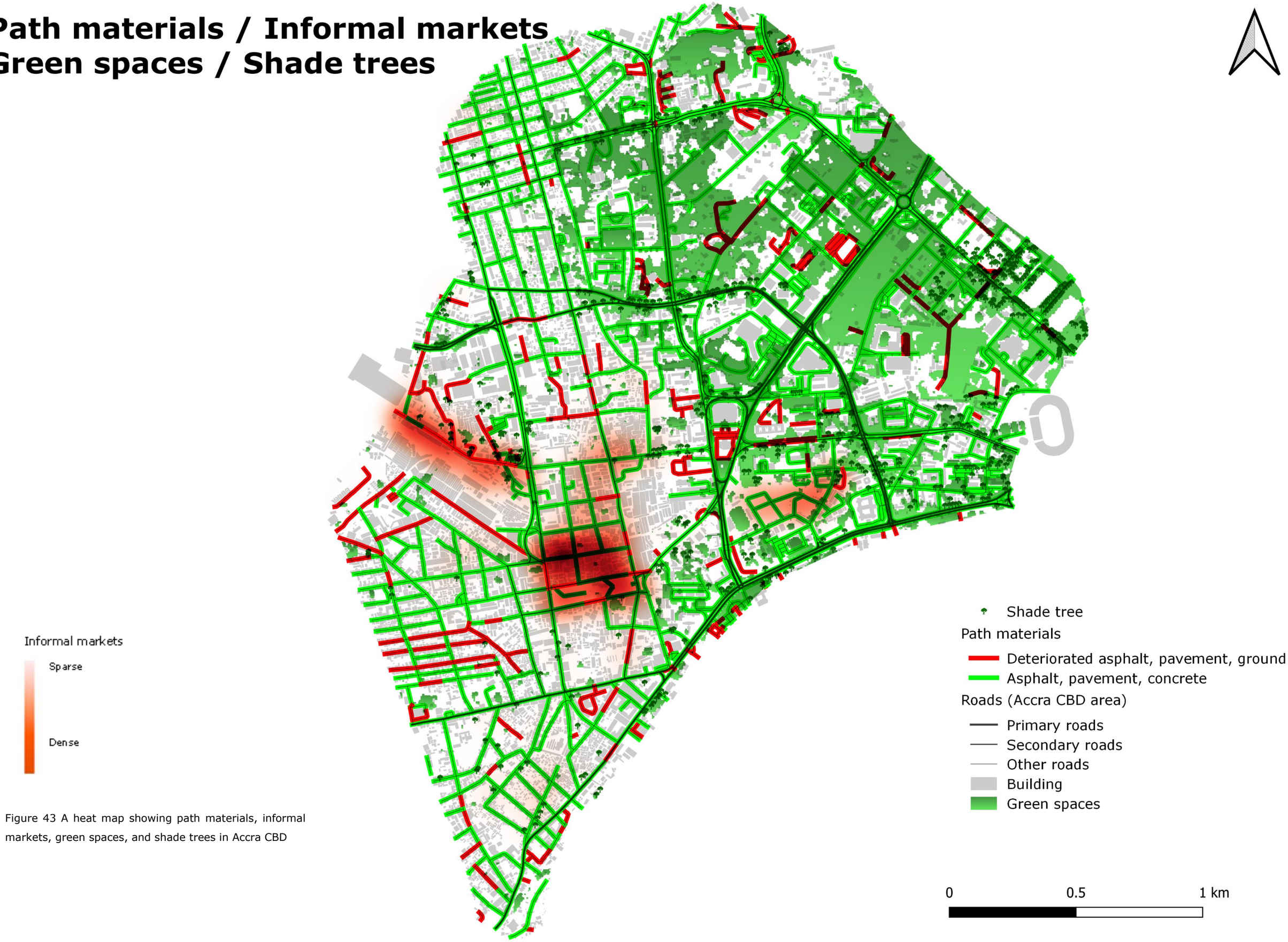


Figure 43 A heat map showing path materials, informal markets, green spaces, and shade trees in Accra CBD

Path obstructions (3)

Here is a heatmap (*Figure 44*) showing path obstructions in the Accra CBD. Path obstructions are identified as any object or situation, that temporarily or permanently impede movement on a path. In this heat map represents spatial extent and intensity of path obstructions available located in the Accra CBD area. Thus, they are observed as negative indicators of walkability. Their presence reduces the walkability for pedestrian. The obstructions include parked vehicles, informal markets, poles, potholes, billboards, kiosk etc. From the map (see *Figure 44*), it is seen that more of the obstructions are located within and along minor roads, such as residential, service, and footways. The issue is more noticed road sharing is unavoidable due to absence of demarcated lanes for pedestrians. When this layer is compared with pedestrian facilities (see *Figure 45*) in the CBD area, it is observed that the path obstructions are mostly located where pedestrian facilities are in the commercial parts of the CBD area. On *Figure 46*, the path obstructions are compared with the street parking in the CBD where it is noticed that where path obstructions are located, street parking is also dominate there. This could only confirm that the street parking are also obstructions as indicated earlier.

Path obstructions

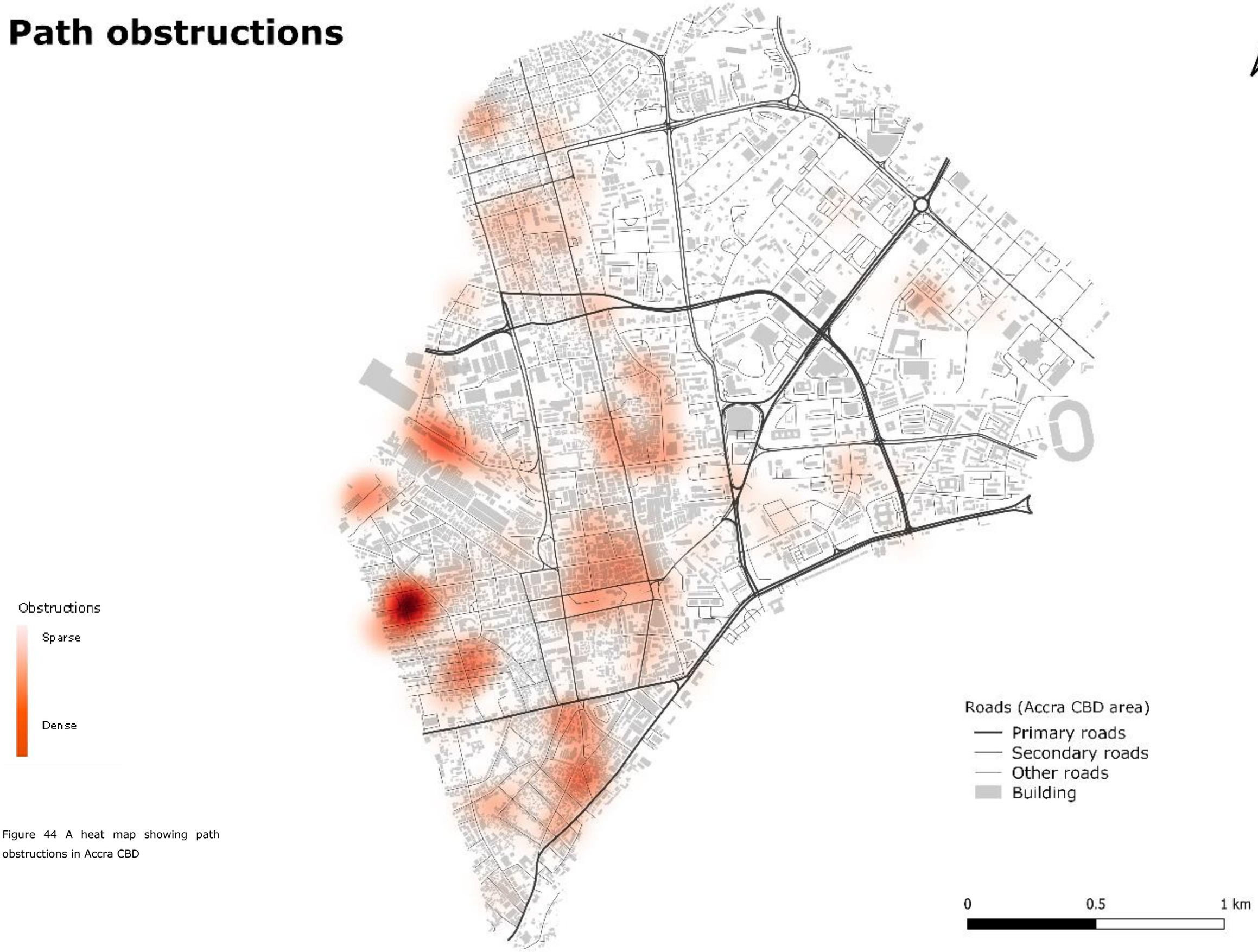


Figure 44 A heat map showing path obstructions in Accra CBD

Path obstructions / Pedestrian facilities

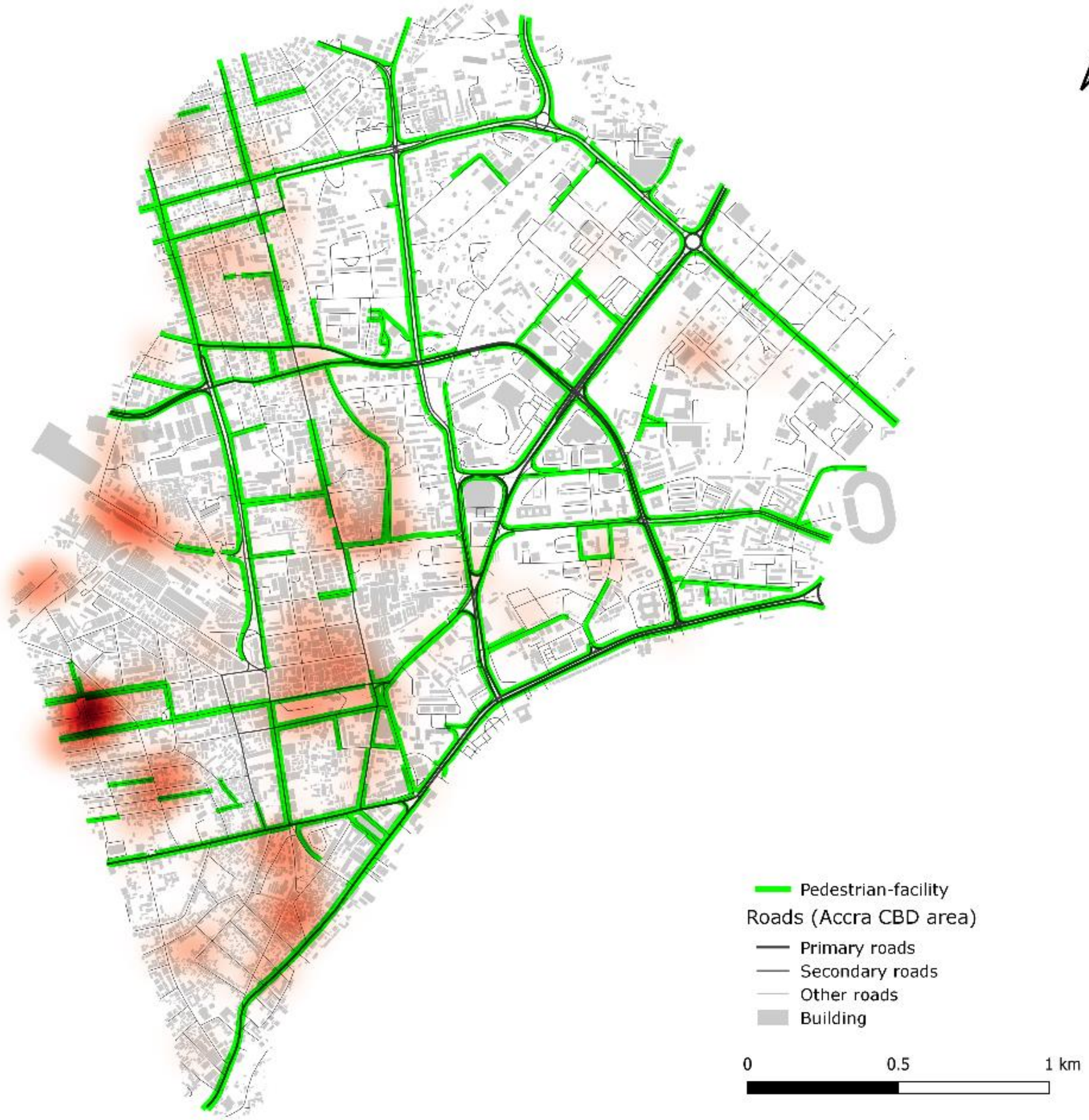


Figure 45 A heat map showing path obstructions and pedestrian facilities in Accra CBD

Path obstructions / Street parking

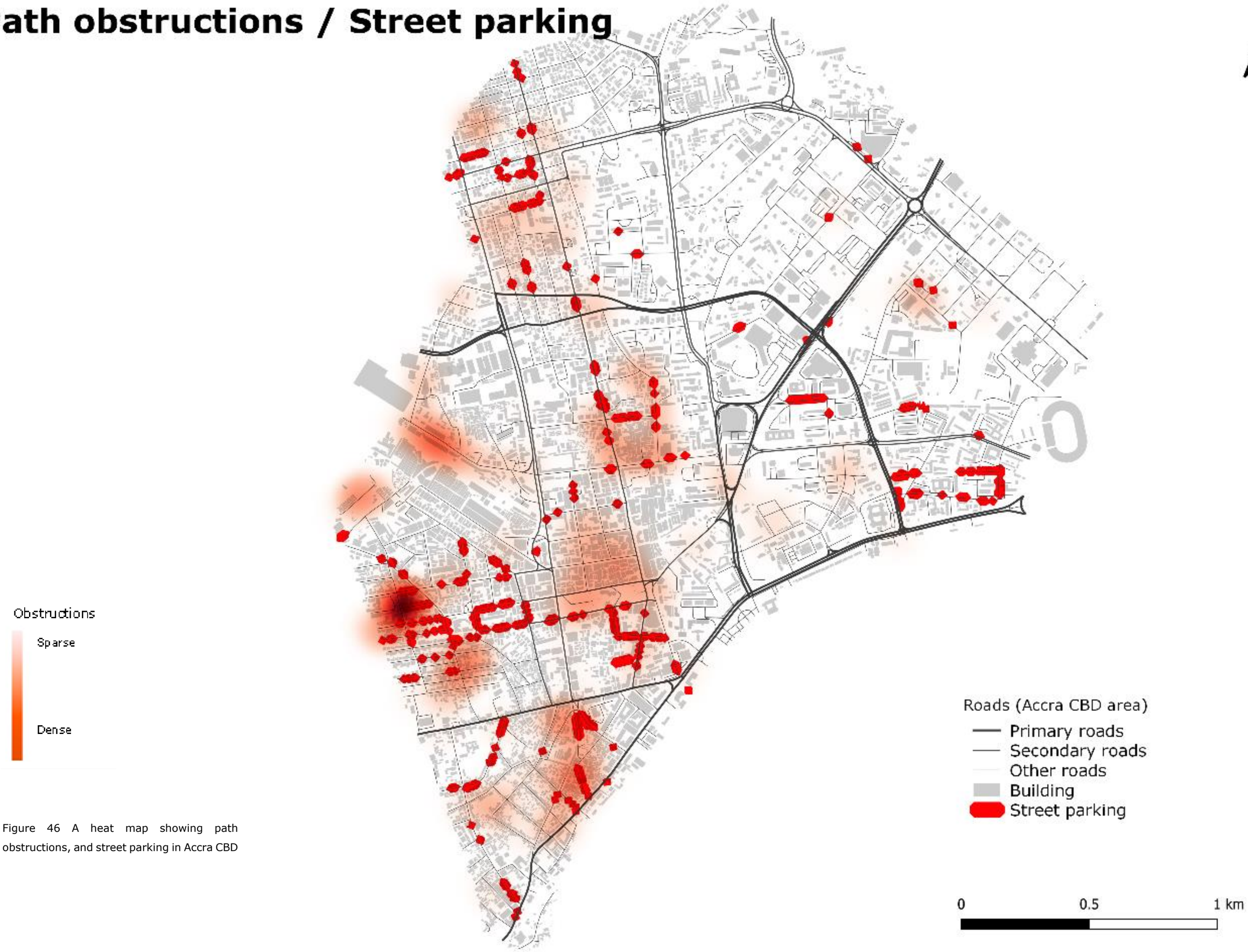


Figure 46 A heat map showing path obstructions, and street parking in Accra CBD

Path completeness (4)

Here is a map of path completeness (see *Figure 47*). It is depicted as a line layer on existing roads. The complete paths are shown as green. Path completeness is a positive indicator of walkability. When paths are complete, they support easy use of walking environment by pedestrians. When absent or not complete, it means the path is obstructed or discontinued.

On the map (*Figure 47*), it be seen that very few paths are complete. They are mostly located on the eastern part of the CBD. *Figure 48* show red paths where paths are not complete. Generally, there are more incomplete paths especially on minor -other roads.

When the path completeness was juxtaposed with crosswalks in the CBD area (see *Figure 49*), it can be seen that indeed where paths are incomplete, there are no crosswalks as well.

Path completeness

Figure 47 A map showing complete paths in Accra CBD

Path completeness

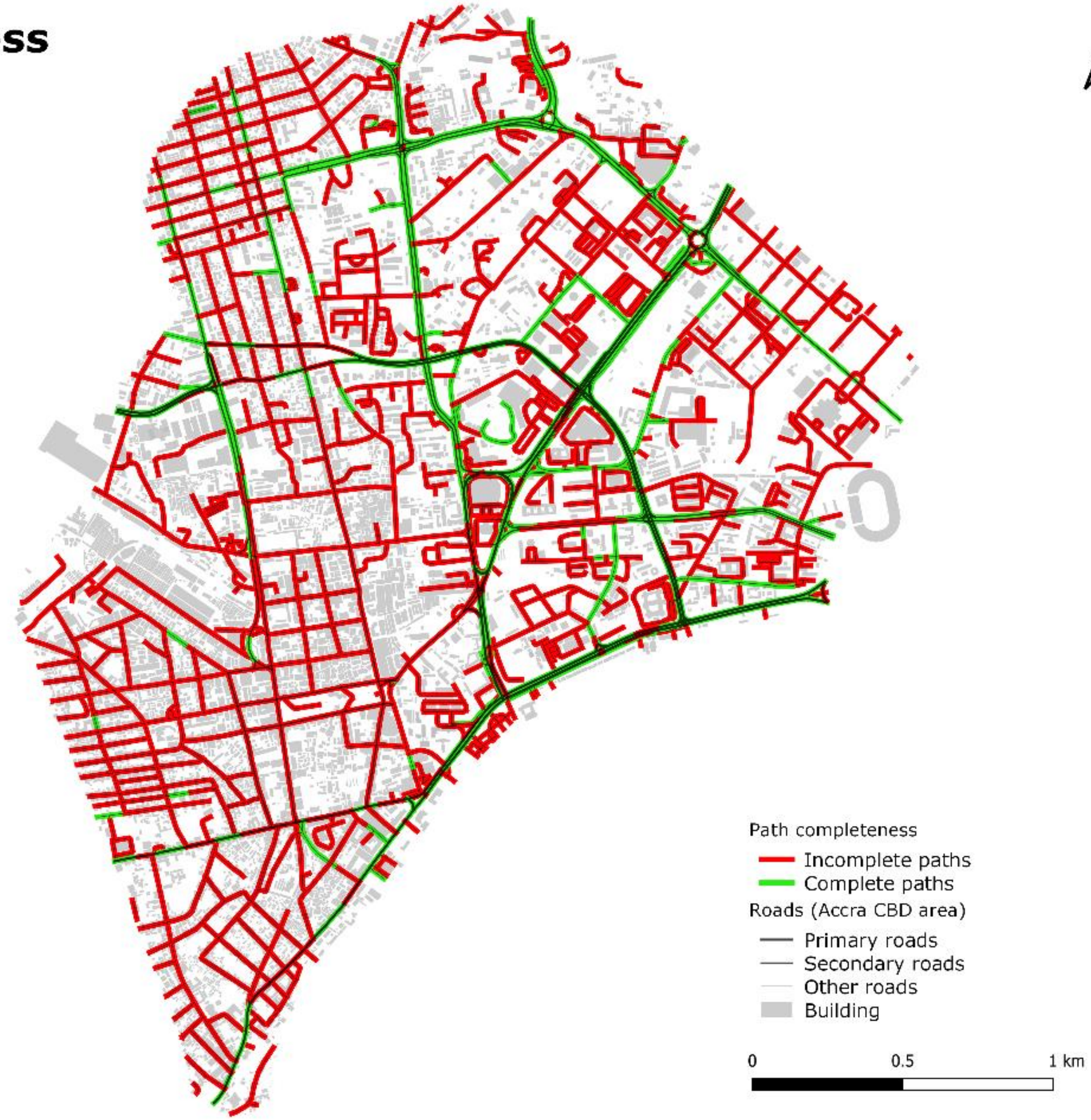


Figure 48 A map showing complete and incomplete paths in Accra CBD

Path completeness / Crossing facilities

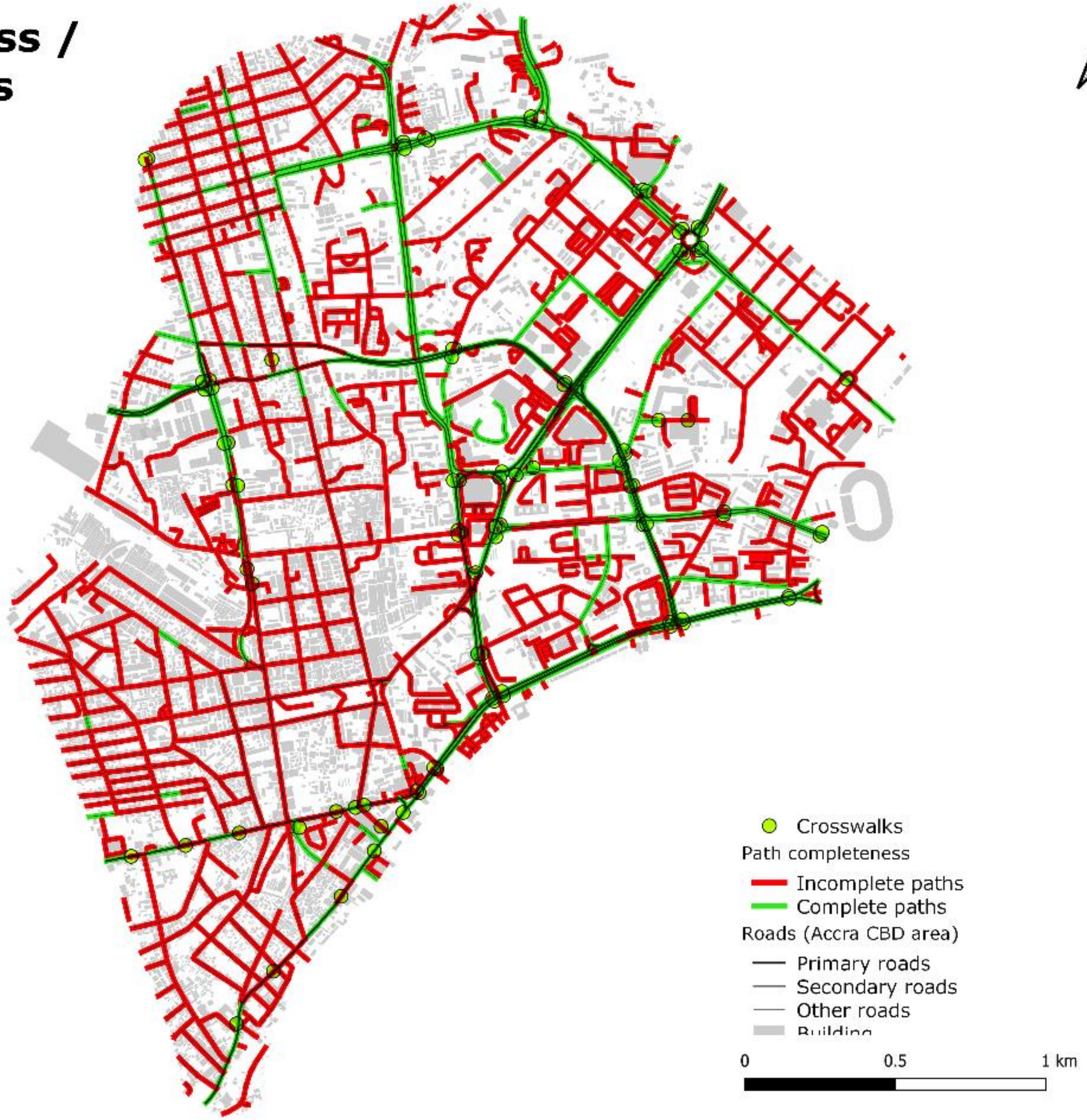


Figure 49 A map showing path completeness and crosswalks in Accra CBD

Lighting (5)

Here is a heatmap showing the lighting situation in the CBD (see *Figure 50*). Lighting is represented as green dots in the map. It is a positive walkability indicator. When light amenities are present, they increase the support for walking for pedestrians.

The map (*Figure 50*) shows that are fair amount of lighting in the CBD. They are found mainly along the major roads. However, it is seen that there appears to be less intensity of lighting on minor roads. There are almost none on other roads.

When the lighting indicator is juxtaposed with the pedestrian facility (see *Figure 51*), it is seen that the lighting is available where pedestrian facilities are present but on major and minor roads. The implication is that walking can be unsafe for pedestrians at nights in the CBD area. Especially in areas with neither lighting nor pedestrian facility.

From this assumption, I add Traffic controls to the lighting and pedestrian facility map (see *Figure 52*). The traffic lights are positive indicators on walking. It is seen that there is a positive spatial relationship with the streetlights available. Where traffic lights are located, there are streetlight. This condition may be able to support walking at night to some extent as shown in *Figure 50*.

Lighting

Figure 50 A map showing lighting in Accra CBD

Lighting / Pedestrian facilities

Figure 51 A map showing lighting, pedestrian facility in Accra CBD

Lighting / Traffic controls / Pedestrian facilities

Figure 52 A map showing lighting, traffic controls and pedestrian facilities in Accra CBD

Crossing facilities (6)

Here is a map showing crossing facilities in the CBD area (see *Figure 53*). The crossing facilities are represented as green points at intersections, junctions, and stops on the map. Crossing facilities refer to the infrastructure available to pedestrians on roads to signal safe crossing. Thus, it is a positive walkability indicator.

It is shown in *Figure 53* that there are not many crossing points throughout the Accra CBD area. It can be observed that most of the crossing facilities are allocated on major and minor roads, with only a few on the minor roads. For instance, on the eastern part of the CBD, it shows that a pedestrian would have to walk more than 100m from the mid-section to access the nearest crossing point.

On the map as shown in *Figure 54*, it can be observed that there are quite a number of faded crosswalks in the CBD area, especially on major roads.

Variations of these crossing facilities range from signalised controlled crossing, visible demarcations, and aided crossings to crossings with no pre-indication. The crossing facility can be zebra crossing, pelican, or puffin that depict different types of crossing conditions – controlled and uncontrolled crossings (see *Figure 55*. The controlled crossing has additional signals to pre-inform other road users of impending crosswalks or to caution them to give way. The map (*Figure 55)* shows the spatial location of both controlled and uncontrolled crossing facilities. It also shows that most major intersections have controlled intersections. The other type is the uncontrolled crossing. This usually has crosswalks or with no further information.

Crosswalks

Figure 53 A map showing crosswalks in Accra CBD

Crosswalks

Figure 54 A map showing crosswalks condition as faded and visible in Accra CBD

Crosswalks

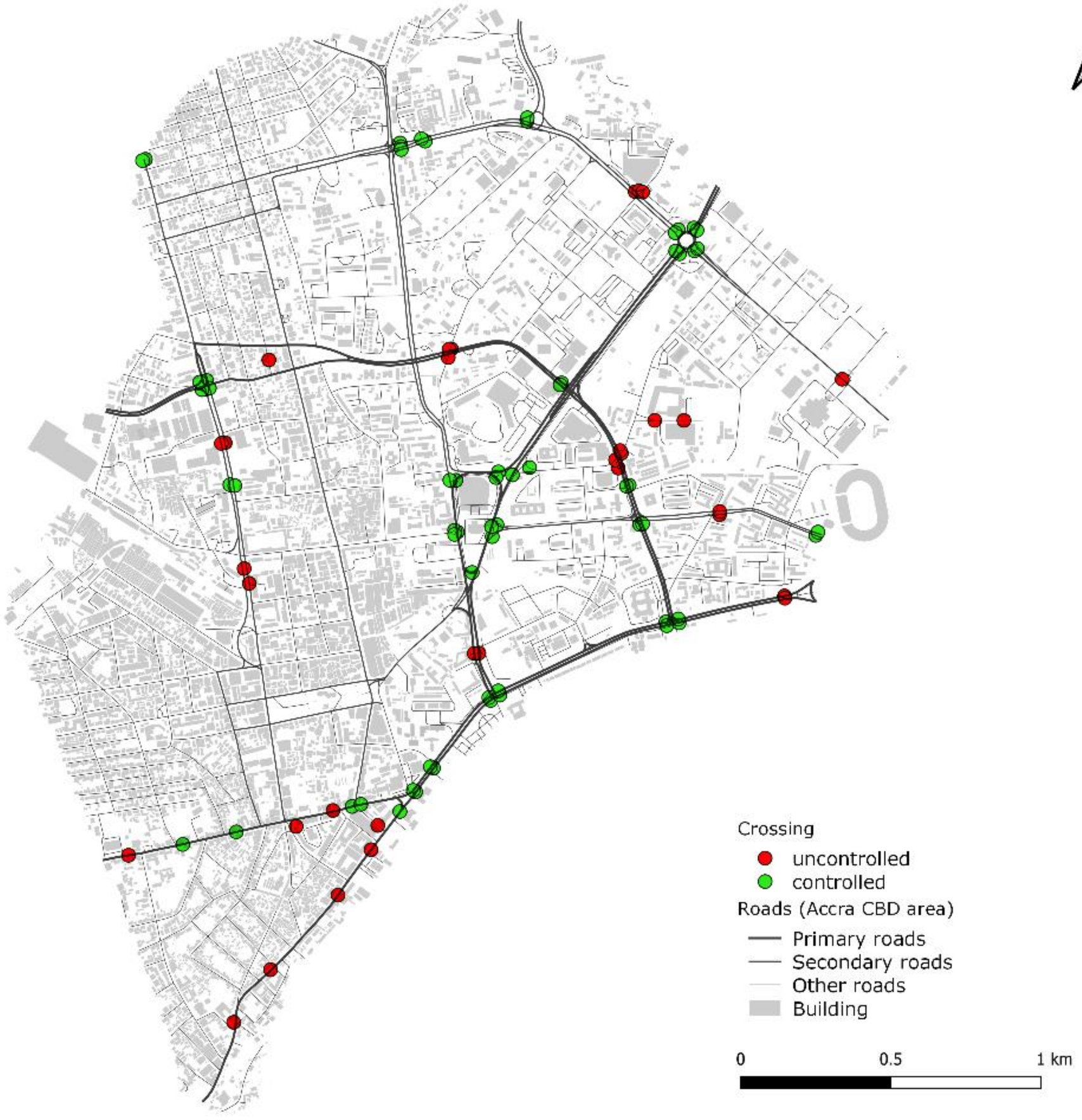


Figure 55 A map showing controlled and uncontrolled crosswalks in Accra CBD

Traffic controls (7)

Here is map showing traffic controls in the Accra CBD area (see *Figure 56*). Traffic lights are positive walkability indicators because their presence signal safe crossing for pedestrians. Thus, encourages walking.

The map below (*Figure 56*) shows that most major roads have signalised intersections and stops. However, the traffic controls are not so presnt in the minor roads . The traffic controls appear to be more spatially located in the southern part where commercial activites are high in the CBD area.

When the traffic was juxtaposed with crossing facilities as green dots and informal markets as heat map (see *Figure 57*), it is seen that indeed where informal marktes are intense, there are traffic controls in good proximity. For crossing facilities, it is seen that where traffic lights are presnt, there are crosswalks available to support walking.

Traffic controls

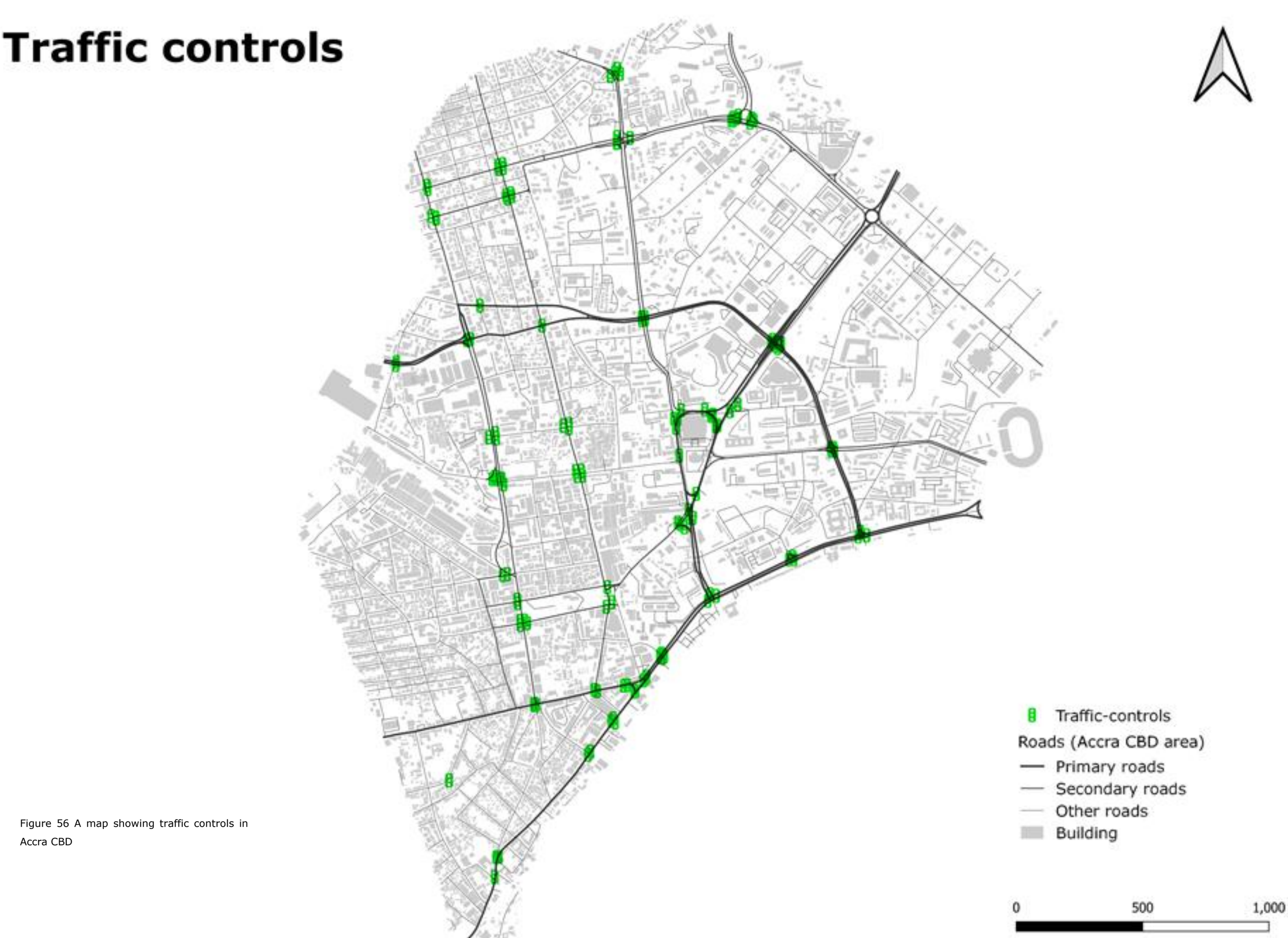


Figure 56 A map showing traffic controls in Accra CBD

Traffic controls / Crossing facilities
Informal markets

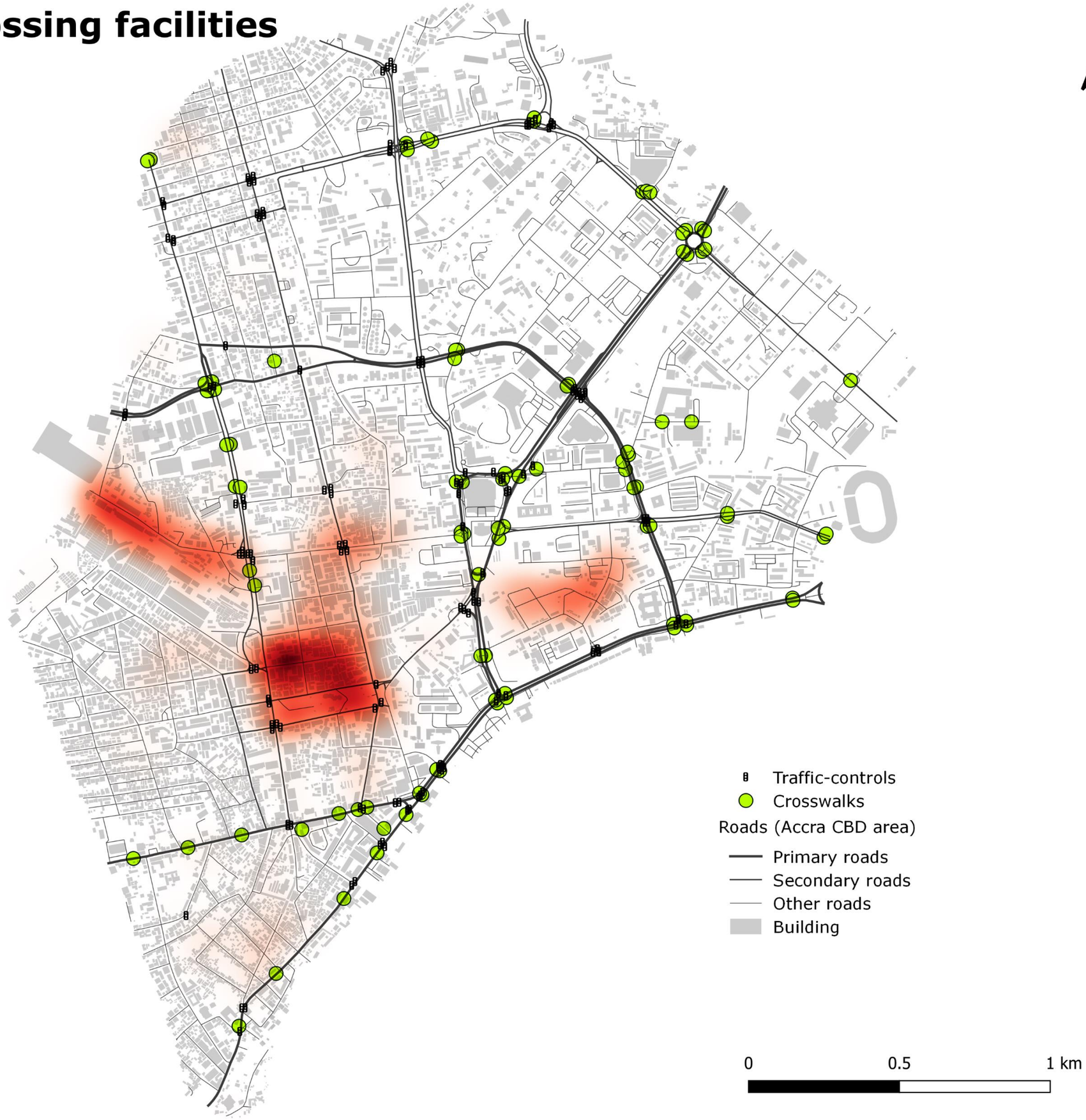


Figure 57 A heat map showing traffic controls, crosswalks, informal markets in Accra CBD

Speed limits (8)

This is a map showing the speed limits in the Accra CBD area (*Figure 58*). By convention, the speed limit for primary roads is 50km/h as shown on the map. Secondary roads have speed limits that range from 40-50km/h. On the minor roads, there is the speed limit range of 20-30km/h.

From the map (*Figure 58*, the CBD is mostly dominated by 20-30km/h max speeds. This can be attributed to the mix land uses in the CBD area.

On the map below (*Figure 59*), crossing facilities and traffic controls are superimposed. This is done because speed limits may matter most to pedestrian when and how they want to crossroads. For this reason, adding crossing facilities, we see that most of the crosswalks are found on roads with 50km/h speeds. Perhaps this is a good thing. Because on such roads, there is a need to have a reasonably caution to vehicles of the presence of pedestrians. Same for traffic lights, these are majorly on 50km/h roads.

Speed limits

Figure 58 A map showing speed limits in Accra CBD

Speed limits / Crossing facilities / Traffic controls

Figure 59 A map showing speed limits, crossing facilities and traffic controls in Accra CBD

Street parking (9)

Here is a map showing street parking in the Accra CBD (*Figure 60*). The street parking is shown as red polygons. This indicator is a negative indicator for walking because when present it reduces walkability of the walking environment. Thus, discourages walking for pedestrian obstructing movement, therefore shown as red on the map.

It is observed that most street parking activities occur in residential and commercial areas on minor roads (*Figure 60*). This could be at the convenience of residents living close to roads. However, it could prove an inconvenient to the pedestrian.

When this activity is compared with the existing pedestrian facilities in the CBD area (see *Figure 61*), it only confirms the above submission. Minor routes in the southern part of the taken over by street parking.

Street Parking

Figure 60 A map showing street parking in Accra CBD

Street Parking / Pedestrian facilities

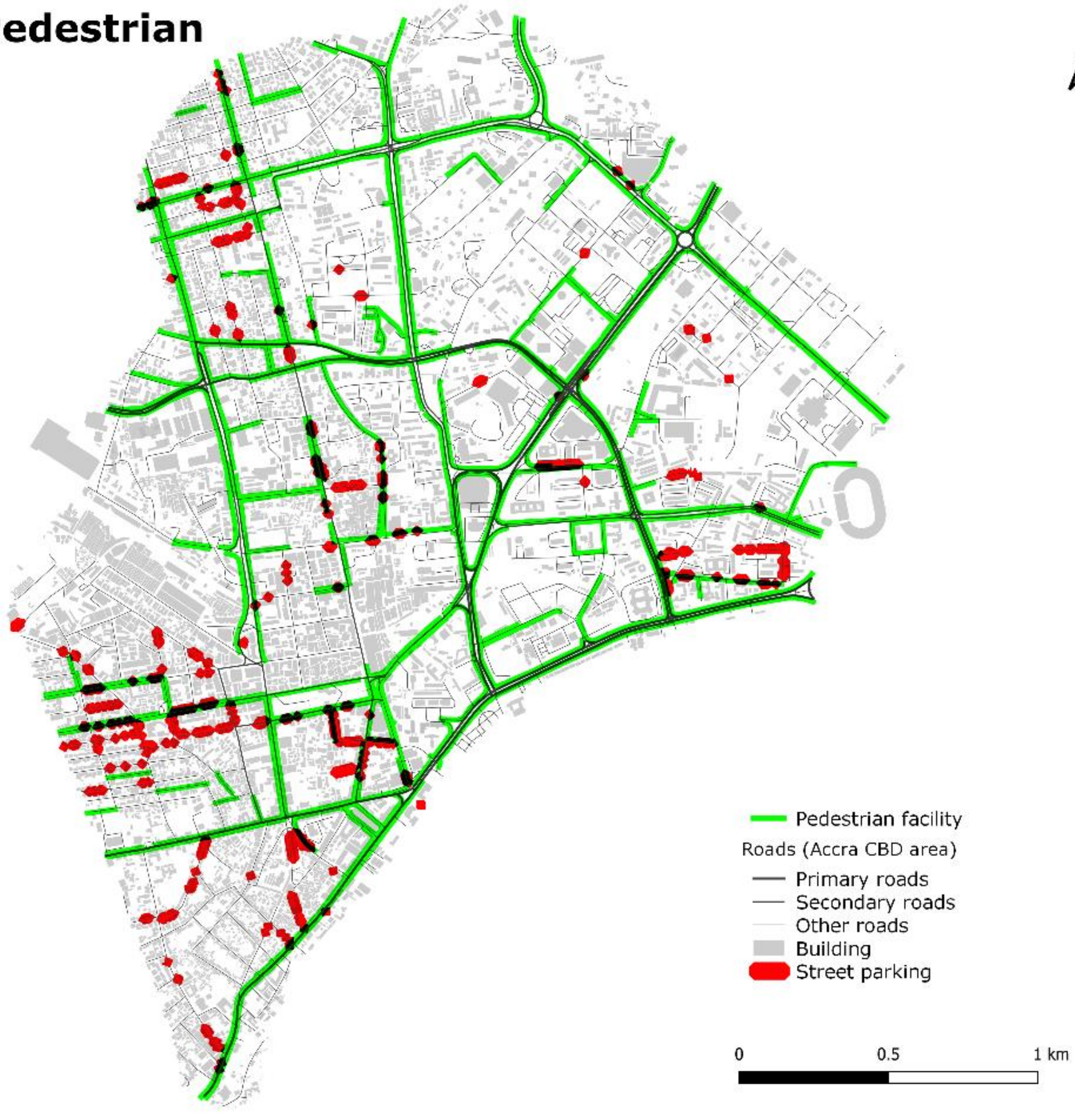


Figure 61 A map showing street parking and pedestrian facilities in Accra CBD

Amenities (11)

This is a map showing amenities available to pedestrians in the Accra CBD area (see *Figure 62*). The amenities are ATMs, Kiosks, banks, churches, restaurants, mosques, hotels, hospitals etc. Looking at the mid-west part of the CBD, there is a noticeable number of amenities, as shown on the heat map (see *Figure 63*). Again, it is observed from the heatmap that the amenities are within inner roads where most secondary roads are.

Amenities

Figure 62 A map showing Amenities in the Accra CBD

Amenities / Pedestrian facilities / Path obstructions

Figure 63 A heat map showing amenities, pedestrian facilities and path obstructions in Accra CBD

Shade trees (12)

Here is a map showing shade trees in the Accra CBD (see *Figure 64*). Shade trees are important in this part of the world where the sun is constantly giving summer vibes. Shade trees are a positive indicator of walkability. Their presence in the walking environment offers support to pedestrians. Thus, the map (*Figure 64*) shows the available shade trees on roadsides in the Accra CBD area. They also contribute to the available overall green spaces in the area. It is observed that there are not so many shade trees in the CBD. The shade trees are found in parts along the coast, in the eastern areas of the CBD as shown in *Figure 64*. These areas house major hospitals, hotels, and state properties.

When juxtaposed with path materials and path obstructions as heat map (see *Figure 65*), it can be seen that the prominence of the shade trees reduces. Spatially, it can be seen that with the areas with deteriorated paths as well as obstructions tend to have little to no shade trees.

The implication will be that during hot weathers, it will be extremely difficult for pedestrians to enjoy the comfort of walking.

Shade trees

Figure 64 A map showing shade trees in Accra CBD

Shade trees / Path materials / Path obstructions

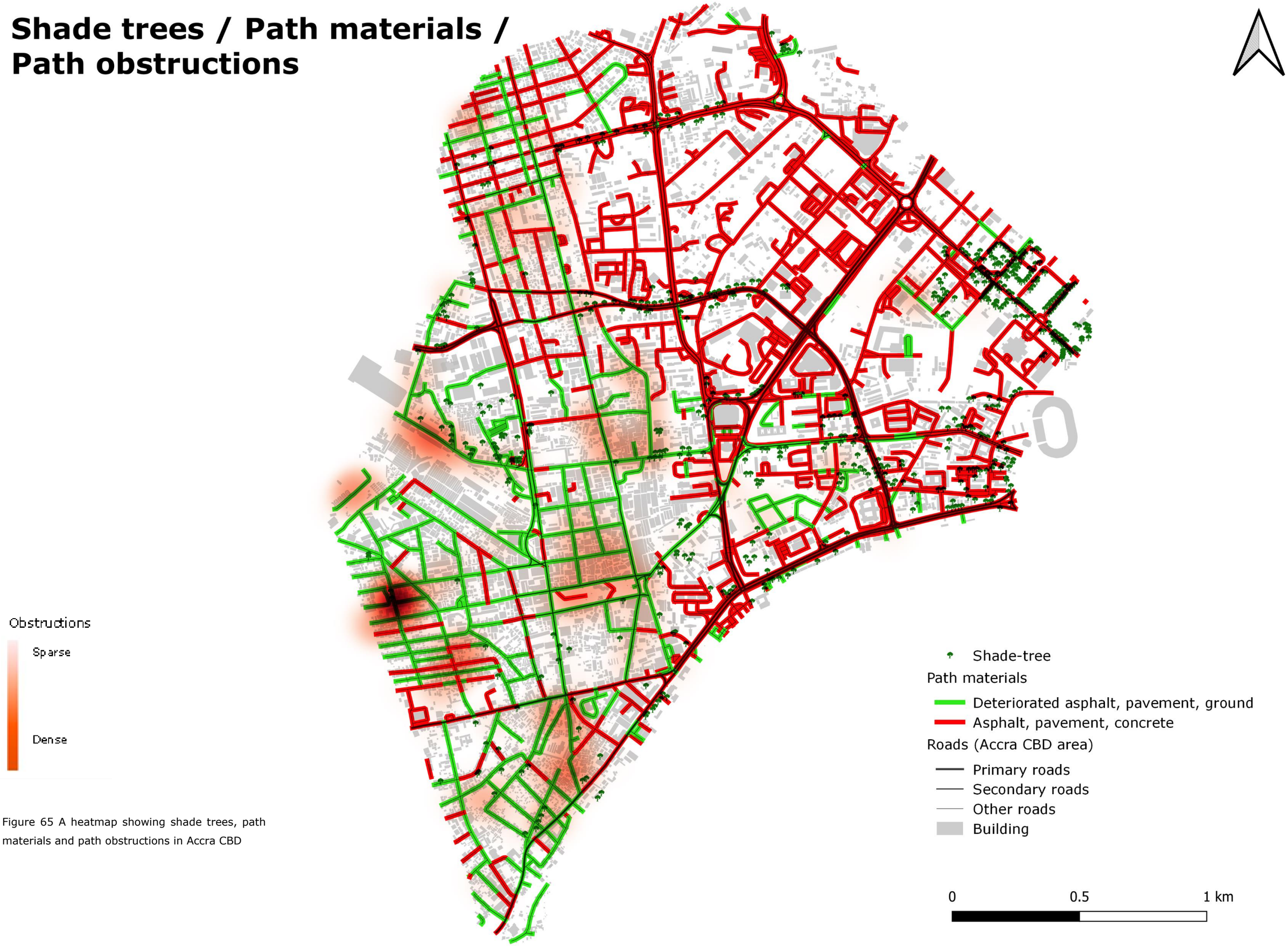


Figure 65 A heatmap showing shade trees, path materials and path obstructions in Accra CBD

Green spaces (13)

This is a map showing green spaces in the Accra CBD area (*Figure 66*). Green spaces are positive indicators of walkability in the walking environment. Thus, shown as green on the map. The green spaces are long strips of green areas, including parks, shade trees, lawns, hedges etc. Following the previous map (*Figure 64*) on shade trees, it appears that, indeed, the eastern and mid-south-eastern parts of the CBD have the highest proportion of greenery, as shown on the map (*Figure 66*).

When compared to the pedestrian facility (see Figure 67), it can be seen that where most of the pedestrian facilities are located, there are green space but only in the eastern part of the CBD area.

Green spaces

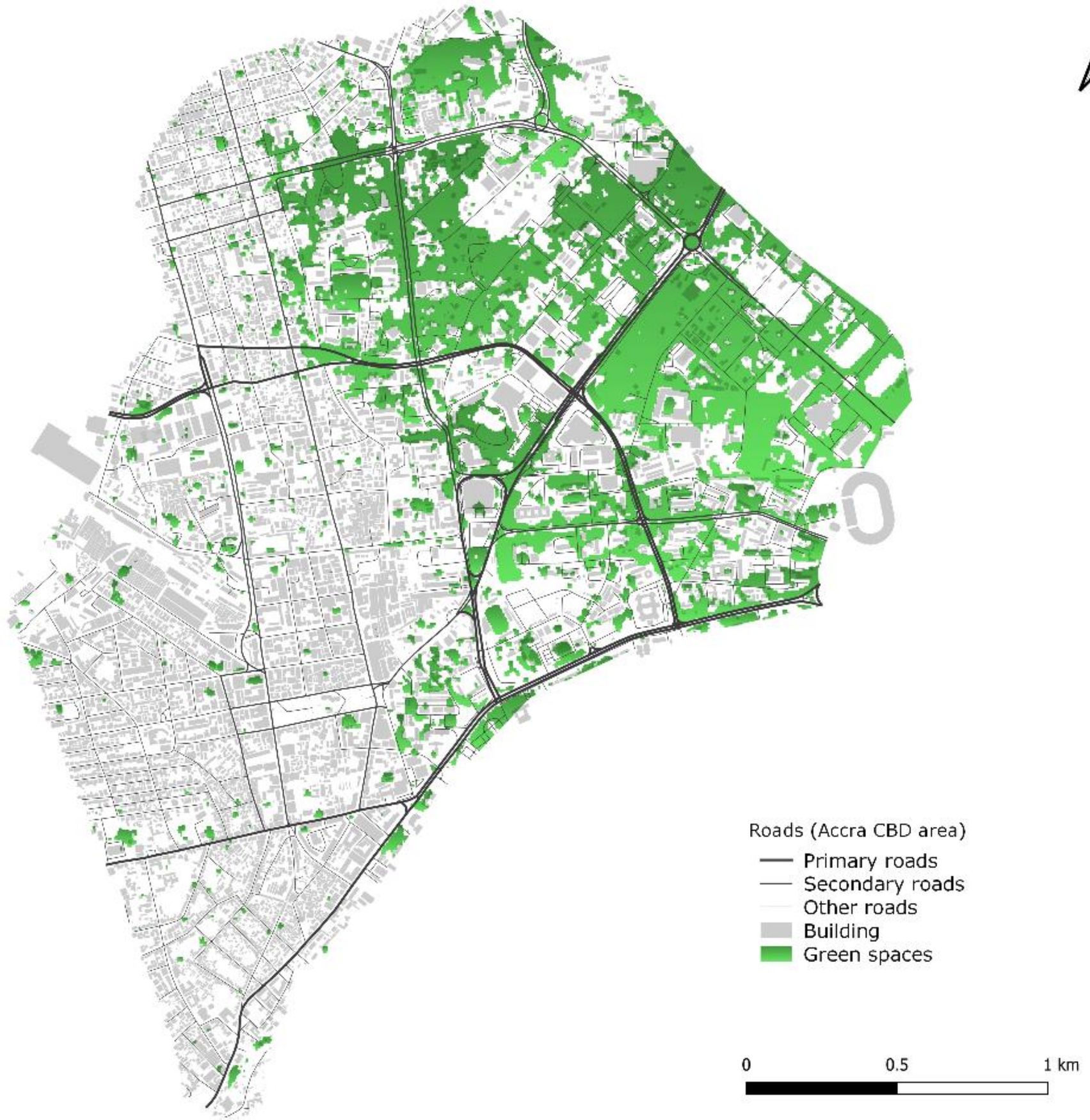


Figure 66 A map showing green spaces in Accra CBD

Green spaces / Pedestrian facilities

Figure 67 A map showing green spaces and pedestrian facilities in Accra CBD

Informal markets (14)

Here is a map showing informal markets in the Accra CBD area (see *Figure 68*). This is a negative walkability indicator shown as a heat map in red. The presence if this indicator reduces space available for pedestrian, thus discourages walking in the walking environment. The informal markets are mobile commercial points that are not regulated. It is also made up of hawkers (including pushers and head porters) and beggars in the CBD. Since Accra is a commercial hub, these situations are very rampant, especially in the CBD as shown in *Figure 68* below.

On the map (*Figure 68*), it is seen that informal market activities are more pronounced in the southwestern part of the CBD. This is where most commercial land uses are found. They are mostly located on secondary-minor roads that easily connect to primary roads where people moving to and from the city are more likely to pass.

In the same vein, when pedestrian facilities are assessed together with informal markets (see *Figure 69*), we see from the map that as this commerce is strategically located along roads to get more buyers, they take parts of pedestrian spaces posing as obstructions.

On the other hand, there seem to be a connection between street parking and informal markets (see *Figure 70*). Where informal markets are located, it can be seen that there is street parking in close proximity.

Informal markets

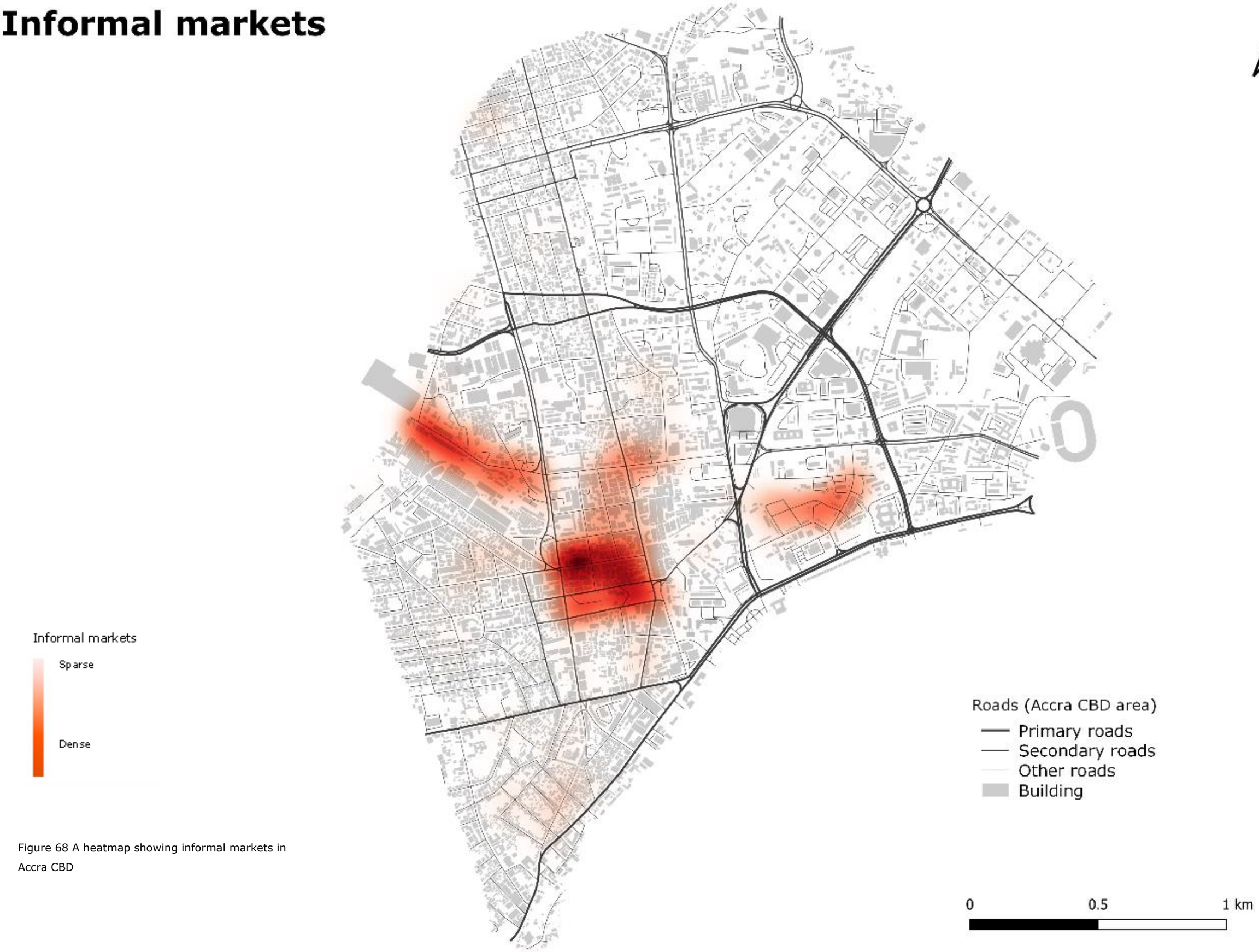


Figure 68 A heatmap showing informal markets in Accra CBD

Informal markets / Lighting / Street parking

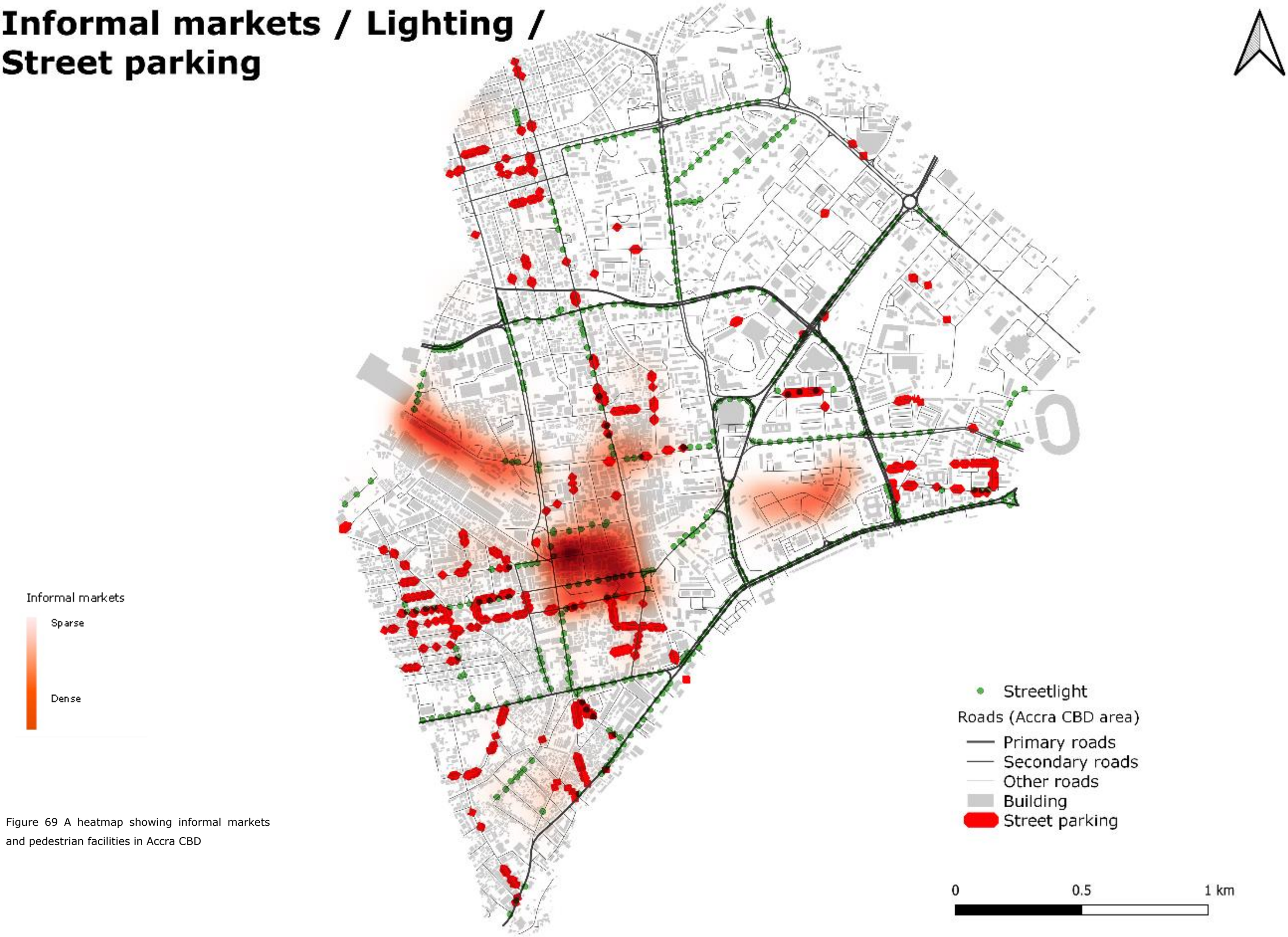


Figure 69 A heatmap showing informal markets and pedestrian facilities in Accra CBD

Informal markets / Pedestrian facilities

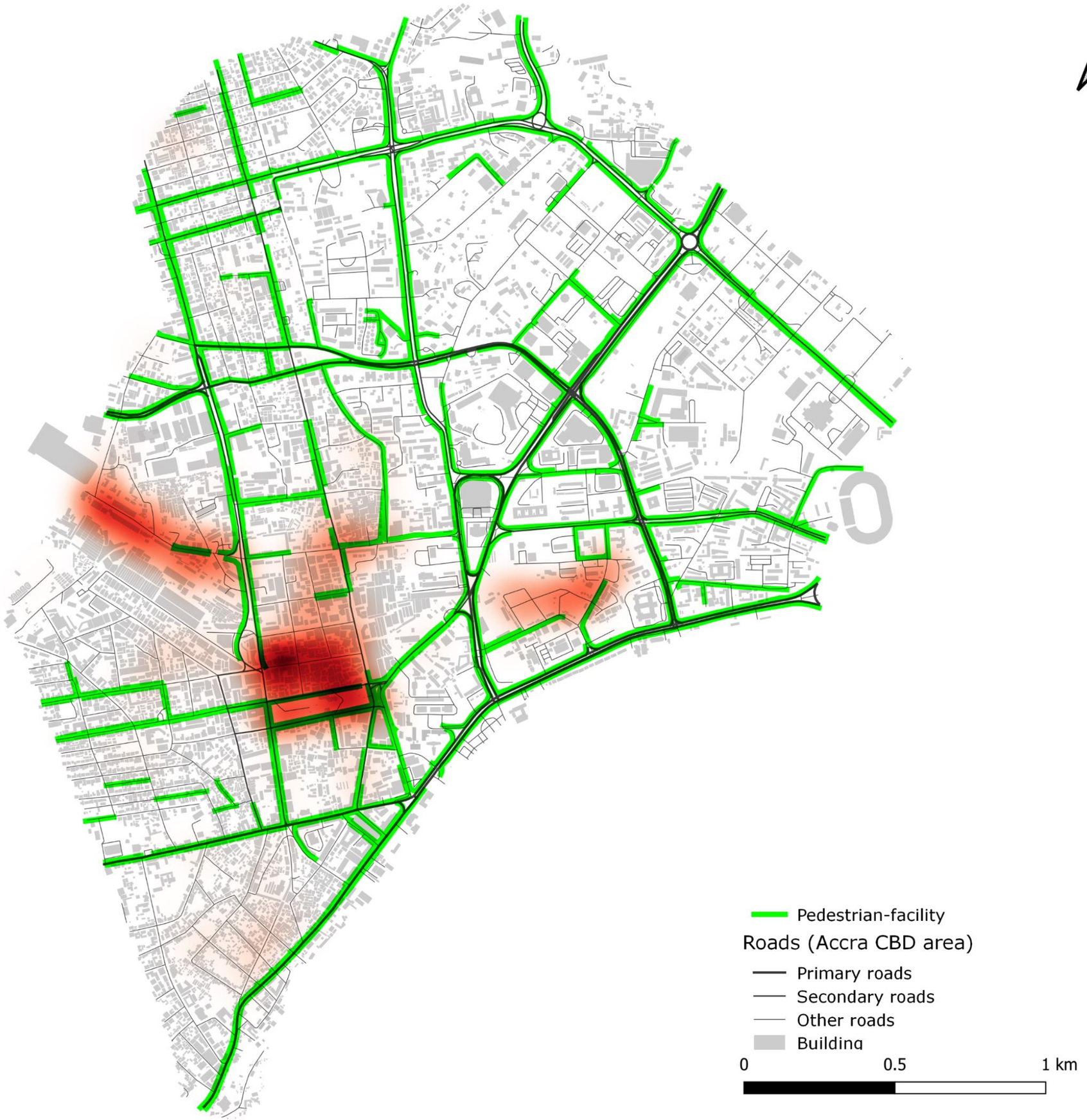


Figure 70 A heatmap showing informal markets, lighting, and street parking Accra CBD

Path cleanliness (15)

This is a map showing path cleanliness in the Accra CBD area (*Figure 71*). This is a positive indicator for walking thus represented by green lines on the map. The clean paths are the ones that do not any litter or heap of trash on the surfaces.

On the map (*Figure 71)* it can be observed there are clean paths located in the north and east parts of the CBD area. It can be seen that the south parts of the CBD do not have clean paths The spatial disparities could be attributed to the number of commercial activities in the south that are dominate in the vicinity. In the north where there are not so many buildings and human activities, there is a good number of clean paths. These are also areas with high end activities and structures.

When this indicator is juxtaposed with green spaces, informal markets and lighting (see *Figure 72)*, it is seen that there is a positive spatial correlation with clean paths and green spaces and lighting shown as green dots and informal markets as shown as heat map.

Cleanliness

Figure 71 A map showing clean paths in Accra CBD

Cleanliness / Lighting / Green spaces
Informal markets

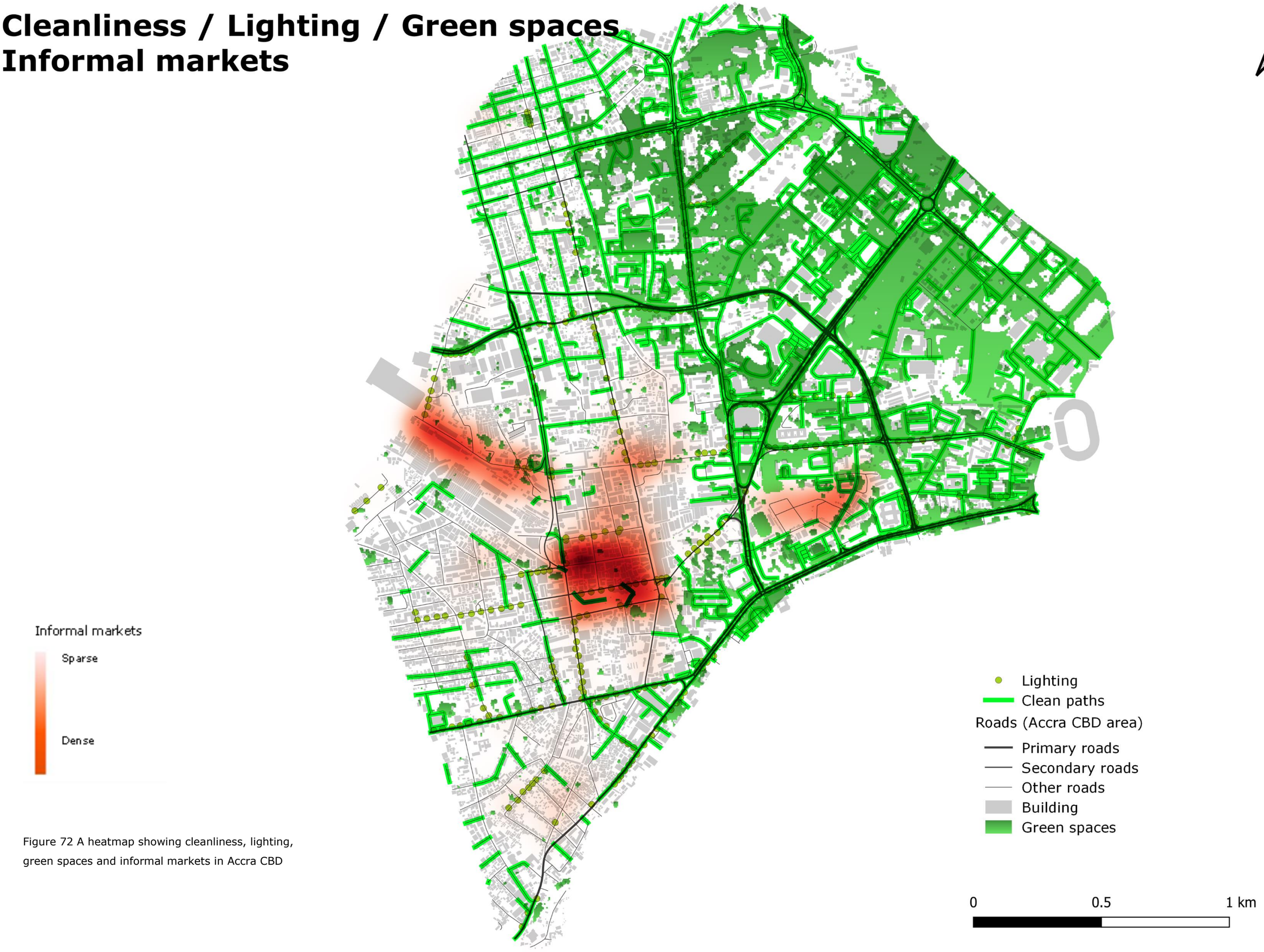


Figure 72 A heatmap showing cleanliness, lighting, green spaces and informal markets in Accra CBD