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ACCESSIBILITY FOR PERSONS WITH DISABILITIES: GLEANINGS FROM THE TWO MOTORWAY INTERCHANGES IN ACCRA, GHANA

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ABSTRACT

Leaving no one behind is central to the Sustainable Development Goals and includes almost a fifth of the world's population who are Persons with Disabilities (PWDs). Their accessibility concerns are, therefore, germane to the world's developmental agenda. With about 8 % of Ghana's population made up of PWDs, the study sought to ascertain how the needs of PWDs had been factored into the design, construction and management of two road interchanges that enclose the only Motorway in Ghana. The study obtained information from interchange consultants and clients using descriptive design and non-probability sampling techniques. There was also an audit of the interchanges using an accessibility standard checklist. The study found that efforts to ensure accessibility of the interchanges were not far-reaching and were constrained by the subjective decisions of clients and poor maintenance culture. The study concludes that there has been little progress in the implementation of protocols, policies and laws related to accessible and inclusive built environments. Accordingly, policy decisions should focus on parameters that will guarantee the enforcement of accessible and inclusive conditions in the design, construction and management of interchanges. These issues should be critical areas of focus for policy to help Ghana achieve the SDGs.

Keywords: Persons with disabilities, Interchange, Accessibility, Sustainable Development Goals.

INTRODUCTION

According to the UN Sustainable Development Group (UN SDG), leaving no one behind (LNOB) is the central, transformative promise of the 2030 agenda for Sustainable Development and its Sustainable Development Goals (SDGs) (UN SDG, 2023). This implies not leaving Persons with Disabilities (PWDs) behind in any facet of life. In consonance with this, as noted by the UN Environment Programme (2023), the SDGs emphasise inclusiveness. Goal 11 stipulates "[the making of] cities and human settlements inclusive, safe, resilient and sustainable" while Target 11.2 specifically notes that by 2030,

"There should be the provision of access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, PWDs and older persons."

Persons with Disabilities make up almost a fifth of the world's population, and their accessibility to the built environment, both as a human right and developmental issue, cannot be taken for granted (UN, 2006; WHO, 2011). Accessible roads, including their interchanges, ought to be of prime importance to countries such as Ghana, which is a party to several international protocols that promote human rights, including those of PWDs, such as the United Nations Convention on the Rights of Persons with Disabilities (CRPD) (UN, 2006).

Badu-Prah (2010) averred that an interchange is a very important structure in the operations and performance of an intersection in any traffic system. According to WHO (2013), roadway design has generally catered to the needs of motorised traffic, neglecting the needs of pedestrians including PWDs. Stoker et. al. (2015) asserted that although PWDs do not comprise a high number of overall pedestrians, they are at particularly high risk of injury or death caused by motorists and vehicles. Ensuring safe and accessible interchanges is therefore not negotiable.

Oxley and Britain (2002) advocated the need to design accessible pedestrian environments. These need to be audited to ensure that they are indeed accessible. However, Danso and Tudzi (2015) undertook a study and concluded that there was ample evidence that some interchanges in Ghana had severe deficiencies as far as accessibility for PWDs was concerned. That study was before Ghana came up with its own accessibility standards for the design and construction of the built environment in 2016 to regulate construction activities in the country.

It is instructive to note that Ghana has ratified the CRPD (UN, 2006) and passed its Persons with Disability Act, which requires that public places be made barrier-free. In consonance with international protocols, the Persons with Disability Act, 2006 (Act 715) requires that new developments in the built environment and old ones that are open to the public should be made accessible to all persons including PWDs. Accordingly, this paper sought to ascertain the state of accessibility on two purposively selected interchanges in Ghana: one built before Ghana's accessibility standards and the other after the standards. The paper proceeds with a review of the literature followed by the research methodology, results and discussion, and then a conclusion. The review dwells on disability, accessibility, and interchange.

LITERATURE REVIEW

Disability

Disability is an evolving concept (UN 2006) and a human rights issue (United Nations Children's Fund, 2013). It is also

a development issue because it may increase the risk of poverty and vice versa (WHO, 2011). It is an umbrella term for impairments, activity limitations, and participation restrictions, denoting the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors). It includes difficulties encountered in any or all three areas of functioning, namely: impairments, activity limitations, and participation restrictions (WHO, 2011).

There are different types of PWDs; however, there is a tendency to focus on wheelchair users and persons with visual or hearing challenges (WHO, 2011). For this research, the five types indicated in the Solidere (2004) were considered: wheelchair users, people with limited walking abilities, those with visual impairment (partially or totally) and those with hearing impairment. The study lumped the first two together as persons with mobility challenges since their challenges are mostly identical. It is estimated that about 15% of the world's population is made up of PWDs, most of whom live in developing countries and most of them are in the poverty bracket (United Nations Department of Economic and Social Affairs, 2015; 2023; United Nations Development Programme, 2014).

There are various models of disability, explaining different perspectives of disability and how PWDs are treated. Two of the main models that were deemed to be suitable for this study were the medical and social models. The medical model, which posits that the person who has the impairment or functioning limitation is the problem while the social model sees society as creating barriers 'that disable people hence inhibiting or limiting their abilities to function or fully participate in society (WHO, 2011; Ocran, 2022). Such barriers may be caused by factors that may be socio-cultural, political, legal, or physical constraints. The current study is founded on the social model. It posits that the accessibility of the interchanges under study is adversely affected by physical barriers created by humankind (United Nations Children's Fund, 2013; WHO, 2011; Kaplan, n.d.; Pfeiffer, 1998). For example, where footbridges are of very steep gradients or kerb ramps have slippery surfaces, these pose as major physical barriers for PWDs.

Accessibility

Accessibility is the degree to which an environment, service, or product allows access by as many people as possible, in particular PWDs (WHO, 2011). It covers communication, the physical environment and transportation (UN, 2006). Accessibility is a concern for everyone; it is a key to sustainable development and is necessary for social inclusion (European Commission, 2003). It is a central consideration in the post-2015 development agenda (United Nations, 2013). This suggests that it is vital to the achievement of the SDGs (United Nations Sustainable Development Group, 2023). The state of the physical environment is one of the key challenges to PWDs in terms of accessibility (UN, 2006; WHO, 2011; Naami, 2019). In this vein, the CRPD in Article 9(1) also asserted that countries,

> *"…shall take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, … and to other facilities and services open or provided to the public, both in urban and in rural areas. These measures, which shall include the identification and elimination of obstacles and barriers to accessibility, shall apply to …buildings, roads, transportation and other indoor and outdoor facilities…"*

To enhance accessibility for all manner of persons, universal design has been advocated as a way to go (United Nations, 2013). This means designing for the whole of the population by creating the maximum utility for the maximum number of people, regardless of age, culture, education or ability level (Kamarudin *et al*., 2014).

There are various laws, policies and protocols that guide the development of inclusive and accessible built environments. Some are binding, others are not. According to WHO (2011), the principle of accessibility may be mandated in law or treaty, and then specified in detail according to international or national regulations, standards, or codes, which may be compulsory or voluntary. Danso and Tudzi (2015) found that before Ghana developed its own accessibility standard, consultants and construction pioneers in Ghana, who wanted to make provision for accessibility in their designs, depended on international standards. These international standards included the following:

- BS 8300 Design of buildings and their approaches to meet the needs of disabled people – Code of practice (British Standards Institution, 2010)
- 2010 ADA Standards for Accessible Design (United States Department of Justice, 2010), and
- The UN and Lebanon's Accessibility for the Disabled: A Design Manual for a Barrier-Free Environment (Solidere, 2004).

These standards are undergirded by various international protocols and national legislations. Ghana, for instance, has a Constitution that guarantees the rights of all persons, including PWDs (Article 17) and provides for PWDs to be able to access public places (Article 29). In this light, the Constitution seeks to provide accessible built environments, including transportation systems. Ghana is also a party to international protocols such as the CRPD (UN, 2006) and the African Charter on Human and Peoples' Rights (ACHPR) that guarantee the rights of PWDs, and as noted earlier, the nation has a Disability Act (Persons with Disability Act 715 of 2006) which stipulates that PWDs should not be discriminated against and should have unfettered access to public places which include interchanges.

Interchanges and Their Accessibility

In the field of road transport, an interchange or a grade-separated junction is a method developed to avoid the disruption of traffic flow at intersections. It can be found at road junctions where two or more surface transport axes cross with each other (The Constructor, 2023). This junction, in the form of either a major-minor priority junction or a roundabout together with the slip roads, can produce a diamond interchange, a half-cloverleaf junction or a roundabout junction (Salter, 1996). Other types include the cloverleaf, trumpet junction, whirlpool, four-level stack and dumbbell interchange (Sabre, 2023). Each of these types has its strengths and weaknesses (The Constructor, 2023). Leisch (1993) identified three controls that may dictate the need for interchanges as the traffic volumes, safety, and the nature of the terrain. This ought to influence the decisions of planners, designers or traffic engineers in the selection of interchange type. His paper was, however, not exclusively devoted to PWDs. What is critical, however, is that, once interchanges are part of the built environment, they ought to have features that make them accessible to all persons. According to Danso and Tudzi (2015), all types of interchanges must cater specifically to the various access needs of PWDs. In consequence, the walkways, kerb ramps, traffic islands, footbridges, signages, traffic signals, pedestrian crossings, and street furniture, among

others, ought to meet accessibility standards to ensure inclusiveness.

According to the Association for Safe International Road Travel (2014), there are different classes of roads in Ghana, including interregional, national and regional roads. The interregional roads (IR) link major cities in Ghana to major cities in other countries. The national roads (N) link major cities and the regional roads (R) may be secondary or primary routes and they serve as feeder roads for the national roads and link settlements and towns.

Beginning with the most severe to the least, Baris and Uslu (2009) found that the environmental barriers, which hamper mobility in urban areas include high kerbs and/or lack of dropped kerbs, steep gradients or ramps, rough or cobbled surfaces, slippery surfaces, narrow pavements, street furniture poorly placed, congested pavements, insufficient designated road-crossing places, and drains near to dropped kerbs. Utari and Kusuma (2021) also identified five variables that can be focused on to meet the mobility needs of PWDs, namely, road dimensions, surfaces, signage, orientation and lighting. A study by Ni *et al*. (2017) asserted that pedestrians' perceptions are frequently associated with crossing facilities, such as refuge islands, crossing length, and traffic signals. Oskarbski *et al*. (2016) observed that traffic signals are one of the most effective means of controlling traffic and a very critical element of pedestrian' service at the signalised intersection. These give them sufficient time to pass a pedestrian crossing. Pedestrians may, however, falsely assume that they are safer and therefore attempt crossing without due caution, increasing their chance of being hit by a motor vehicle (Koepsell et. al., 2002). It has also been observed that accessibility to a public restroom is of paramount importance to PWDs (Goldsmith, 1976; Luketic, 2024; Bragg, 2025).

Requirements for the provision of accessible designs relating to traffic and transportation facilities of the external built environment deal with: Car parking, Gradients and ramps, Signage, Paths to buildings, Steps, Stairs and landings, Handrails, Pedestrian crossings, Traffic Signals, Washrooms, Obstacles on a path, Street furniture, seating and rest areas. These requirements can be found in standards such as: Design of an accessible and inclusive built environment: Buildings - code of practice (BS 8300-1:2018); Design of an accessible and inclusive built environment: External environment - code of practice (BS 8300-2:2018); Solidere (2004), Building construction — Accessibility and usability of the built environment (ISO 21542:2011); ADA Accessibility Guidelines (ADAAG,1998); and the Ghana Building and Construction Materials-Accessibility Standard for the Built Environment (GS 1119, 2016).The requirements and barriers to grade-separated interchanges and urban roads are presented in Table 1.

Table 1: Elements required for accessing Grade separated interchanges and urban roads.

	ELEMENTS	REQUIREMENTS AND BARRIERS	SOURCE
1	Walkways	Uneven walkways, Presence of obstacles and protruding elements in the pathway, Presence of hawkers and kiosks on pathways, Interruption of movement by parked vehicles. Routes should be direct, continuous, safe, convenient and attractive. Dimensions of gaps, grates and openings.	DSAPT (2002), Solidere (2004), FADS (2009), BS 8300-1:2018
2	Traffic Islands	Number of lanes to cross in two directions, width of island, and raised or unraised island.	DSAPT (2002), (GS 1119:2016)
3	Kerb Ramps	Inadequate ramps, Slippery ramp surfaces, Improper design of the transition between kerbs and street.	DSAPT (2002), Solidere (2004), FADS (2009), AHRC, (2010), (GS 1119:2016), BS 8300-1:2018
4	Footbridges	Ramped access, Gentle slope, Handrails on both sides, must be adequately lit at night.	(GS 1119:2016), DSAPT (2002), Facility Accessibility Design Standards (2009)
5	Signage	Provision of information in formats that can be assimilated using more than one sense, Inadequate signage, Poor positioning of signage, Uneasy identification of access routes and accessible facilities.	(GS 1119:2016), AHRC, (2010), Solidere (2004), DSAPT (2002), FADS, (2009), BS 8300-1:2018
6	Lighting	Adequate street lighting at night and levels should be a minimum of 30 lux consistently on walkways, paths, ramps, car parks etc. Light sources and fixtures should minimise glare.	DSAPT (2002), FADS, (2009), AHRC, (2010), (GS 1119:2016), BS 8300-1:2018
7	Shelter/Bus Stop	Surfaces must be stable, firm, well-drained and slip-resistant. Unobstructed access to the bus stop, Appropriate kerb height at the boarding point, Access ramp to bus stop required if boarding point not at the same level as access path, Seating, Allocated spaces, Bus stop sign, Tactile Ground Surface Indicators, Lighting.	DSAPT (2002), Facility Accessibility Design Standards (2009), Australian Human Rights Commission Accessible Bus Stops Guidelines (2010), (GS 1119:2016)

8	Zebra Crossings	No guide strips for the blind, Faded pedestrian crossings, Inadequate pedestrian crossings, Absence of speed humps.	DSAPT (2002), Solidere (2004), FADS, (2009), (CRPD, 2013), (GS 1119:2016)
9	Traffic Signals	Clear and audible signals from traffic lights, the presence of countdown devices, Push buttons should require a minimum amount of force for activation and should be located as close as possible to the kerb ramp. Device should be operated from a level landing and at a height not higher than 1.0 m above the sidewalk	DSAPT (2002), FADS, (2009), (CRPD, 2013), BS 8300-1:2018
10	Washrooms	Must be on an accessible route and identified by signage, incorporate a clear floor space to allow a PWD to manoeuvre, Adequate door widths and not swing into the clear floor space required for any fixture. Appropriate fixtures including grab bars.	Solidere (2004), Facility Accessibility Design Standards (2009), (GS 1119:2016), BS 8300-1:2018
11	Parking spaces	Uneven surfaces and well-drained surfaces., No designated parking bays for PWDs, Parking aisles are insufficient in width.	DSAPT (2002), Solidere (2004), FADS, (2009), (GS 1119:2016), BS 8300-1:2018
12	Street Furniture	Inadequate street furniture, Improper design of street furniture, Blocking of pathways by street furniture, Inaccessible street furniture	DSAPT (2002), Solidere (2004), FADS, (2009), AHRC, (2010)

Authors' construct, 2023

MATERIALS AND METHODS

The study adopted a descriptive research design. A mixed-method approach involving both qualitative and quantitative data was used. This was deemed ideal to give a holistic perspective on the phenomenon under study (Creswell and Guetterman, 2020). The quantitative method was complemented by the qualitative method whichprovides depth insights to the meanings of the data provided by the quantitative method. Both primary and secondary data were used for the study. For the primary data, a two-pronged approach was used to allow for triangulation and ultimately enrich the data collected with a consequent positive impact on the validity of conclusions drawn from the findings. It involved the use of an interview guide and a checklist. A total of 9 respondents, made up of eight professionals (engineers) and a representative of the Ghana Federation of Disability Organisations (GFD) took part in the study.

The data were gathered sequentially, with the interchange site information being gathered first. It involved the use of the checklist to assess various aspects of the interchanges. The data gleaned this way served as baseline information for subsequent interviews with the engineers and the representative from the GFD. The researchers were therefore approaching the interview process from a point of knowledge gleaned from the first stage data gathered from the interchange sites. The data were gathered in 2022 with the assistance of students from the Faculty of Built Environment of the Kwame Nkrumah University of Science and Technology who served as research assistants. The interviews were conducted using a combination of English and Twi (local dialect) so as to ensure understanding and consequently the provision of appropriate answers by the interviewees.

The researchers purposively selected institutions that were deemed to play key roles in the design, construction and supervision of the interchanges for the interviews. This was considered necessary because of the expert and insightful knowledge that was to be gleaned from such sources. Beyond being part of such an institution; membership of the appropriate professional body (Ghana Institution of Engineers); involvement and experience in the development, supervision and management of the interchanges; and knowledge about disability issues were parameters that informed the purposive selection of interviewees from the Accra Metropolitan Assembly, Tema Metropolitan Assembly, Ministry of Roads and Highways, the Ghana Highway Authority, Department of Urban Roads and a private consulting firm.

The interviews took place at the time and place preferred by the interviewee after making such arrangements. This followed an initial interaction where each prospective interviewee was exposed to the purpose of the study and the need to go through the informed consent protocols. The information sought was in three parts, namely demographic information about the respondents, information on the construction and management processes, and finally issues of disability access. With the interviewee's prior approval, the sessions were recorded with a phone to avoid missing out on any relevant information. In the main, the interviews were face-to-face. Aside from the face-to-face, phone and Zoom meetings were also used in the case of those who preferred such options or as a means to follow up for clarity on certain aspects after the face-to-face sessions. The representative of the GFD, was purposively selected for an in-depth interview to ascertain the perception of this key stakeholder organisation, regarding the accessibility of the interchanges.

The recorded interviews were transcribed and edited to ensure completeness and accuracy. Content analysis was employed as a methodological approach to analyse the collected qualitative data. Content analysis is a commonly used methodological approach in qualitative research for analysing collected data, which involves systematically categorising and interpreting textual or visual information to extract meaningful themes and patterns (Elo et. al., 2013; Bengtsson, 2016). There was hierarchical coding where the key elements of the interchanges came first, their accessibility or inaccessibility followed and then came the specific attributes. For example, there was a key element as the walkway, then its accessibility or otherwise and finally a specific attribute like the surface, which was slippery. An Excel spreadsheet was used as a codebook for the purpose. Deductive coding was employed so as to align the data with that of the checklist for the purpose of analysis and triangulation. By employing this methodological approach, the researchers were able to identify and analyse the challenges and constraints in

ensuring the accessibility of the interchanges in relation to the needs of PWD. Microsoft Excel was used to analyse the quantitative data using simple frequencies.

A checklist was designed from Ghana's Building and Construction Materials-Accessibility Standard for the Built Environment (GS 1119:2016), Code on Accessibility in the Built Environment (2013), Disability Standards for Accessible Public Transport (DSAPT) (2002), Guidelines for the Development of Public Transport Interchange Facilities (2008), Australian Human Rights Commission Accessible Bus Stops Guidelines (2010), Facility Accessibility Design Standards (2009), BS 8300-1:2018, BS 8300-2:2018, and Solidere (2004). The elements audited included walkways, traffic islands, kerb ramps, footbridges, signage, lighting, shelter/bus stops, pedestrian crossings, traffic signals, washrooms, parking spaces, and street furniture. The findings have been discussed under each of the key parameters studied.

Research ethics are expected to be upheld in any academic endeavour, especially when it involves human participants. In this regard, letters were sent to the various institutions to ensure that research protocols had been adhered to. Furthermore, individual participants were briefed about the research and its purpose prior to participating in the research. They were also made aware that it was purely voluntary and they could opt out or refuse to answer any specific questions at any point in time. They were assured that to guarantee anonymity and confidentiality, codes and pseudo-names would be used. In each case, the verbal consent of the participant was secured prior to the commencement of the data collection. Therefore, for ethical reasons, the identities of the respondents/interviewees and their organisations have been concealed except where it is deemed very necessary and also does not have the potential to taint the person/institution's image.

Study Area

There are 13 major interchanges in Ghana. These are Asafo, Asokwa and Sofoline Interchanges in the Ashanti Region; Arko Adjei, Apenkwa, Dimples, Kwame Nkrumah, Mallam, Pokuase, Tema Motorway and Tetteh Quarshie Interchanges all in the Greater Accra Region; and Tamale Interchange in the Northern Region. The Arko Adjei Interchange, which happens to be the first to be constructed in the country, was completed in 1999, while the Pokuase Interchange is the second four-level stack interchange in Africa and the first in West Africa. The study purposively focused on the two interchanges, the Tema Motorway Interchange (TMI) and Tetteh Quarshie Interchange (TQI) because first, they flank the Accra-Tema Motorway; the only and all-important motorway in Ghana (Figure. 1). The Accra - Tema Motorway is a 19-kilometre highway that links the city of Tema, which is home to Ghana's largest port and industrial enclave, to Accra, the capital city of Ghana. Secondly, the Greater Accra Region is at the nodal point of three international transit corridors; Abidjan-Lagos Corridor, a part of the Dakar to Lagos Trans African Highway (TAH) No.7 of the Economic Community of Western African States (ECOWAS); Central Corridor and; Eastern Corridor of Ghana that links Ghana's biggest Tema port with the land-locked neighbours of Burkina Faso, Mali and Niger (Japan International Cooperation Agency (JICA), 2017). Hence the development of roads and interchanges in the region is seen as a great boost to ECOWAS in particular and the objectives of the African Continental Free Trade Area (AfCFTA).

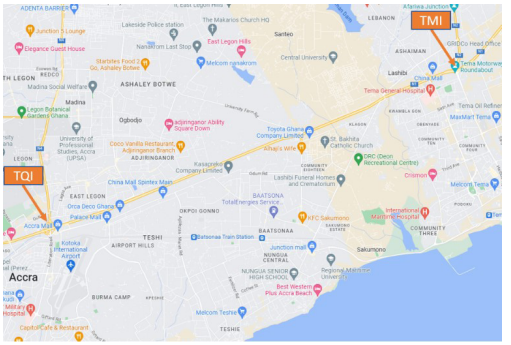

Figure 1: Google map showing (TQI) and (TMI) at the two ends of the Accra-Tema Motorway

(Google Maps, n.d.-b)

Thirdly, the National Transport Policy of Ghana places a high premium on the development of road networks in the Greater Accra Region, key among the reasons being its unique implications for contiguous international communities (JICA, 2017). Greater Accra is the most populous region with 17.7% of the nation's population (5,446,237) (Ghana Statistical Service, 2023). The foregoing shows the strategic importance of the Accra -Tema motorway and its interchanges to both Ghana and the West African subregion due to the vast array of vehicles, passengers and pedestrians that use them, hence the need to make them accessible to all users, including PWDs. Although some studies had been conducted on the accessibility of TQI by Danso and Tudzi (2015), the present study has been necessitated by the introduction of the Ghana Accessibility Standard in 2016 (GS 1119:2016) and the construction of TMI in 2020, since the last study, and the deterioration that has occurred at TQI due to the poor maintenance of the interchange. Finally, the present study on TQI is more detailed than the previous one.

The TQI is a cloverleaf interchange carrying a six-lane motorway and is located at the intersection of two national roads N1 and N4 (Figure. 2). It has detours from Accra, Achimota, Legon, Spintex and Tema. It links the Liberation Road from 37 Military Hospital to the Pantang junction through Madina. The interchange has four loops and four slip boards, a bridge on the motorways, four staircases, a roundabout, road furniture, drains, kerbs, street lighting, guardrails and decorative vegetation (Modern Ghana News, 2005). The immediate environs of the TQI are dominated by mixed land uses (Badu-Prah, 2010). Figure 2 shows key locations as indicating the footbridge (FB), Pedestrian crossing (PCI), Grade separation bridge (GS) and Intersection (INT).

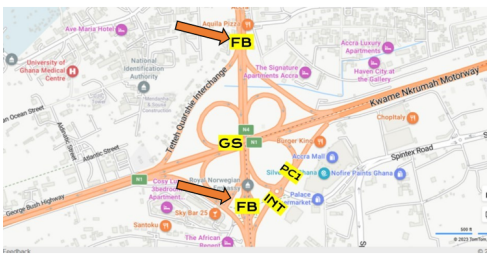

Figure 2: Google Map Road View of TQI showing the Footbridges (FB) with wheelchair ramps

The Tema Motorway Interchange (TMI), which is a variant diverging diamond interchange, is situated to the east of the motorway (Figures. 3 and 4). It was financed by the Japanese International Cooperation Agency (JICA) and it cost 60 million dollars. The project, which commenced in 2018, had a 2-year planned period for completion. The project was born out of the government's National Transport Policy of 2008, which is aimed at expanding and upgrading Ghana's international corridors to achieve an integrated, efficient, and sustainable transport system and brace Ghana as the transport hub of West Africa (JICA, 2017). This interchange was constructed to replace the Tema roundabout, which was prone to severe traffic congestion. However, it was not only to ensure the secure, smooth flow of international logistics but also to support the transportation of the increasing cargo from

the Tema port and help resolve traffic issues in the region. It is a 5-leg roundabout where traffic from Accra and Tema Port converges (JICA, 2017). The area around the Tema intersection is within the Tema Development Corporation (TDC) Acquisition area, where open spaces tend to be full of vendors and small shops (JICA, 2017).

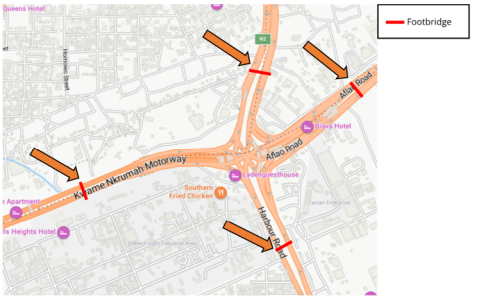

Figure 3: Google Map Road View of TMI

Figure. 4 Google Map Hybrid View of TMI

For this reason, existing construction and new ones are without any justifiable basis to remain inaccessible to PWDs. The Sustainable Development Goals under the 'mantra', *leaving no one behind,* also advocates for inclusiveness and sustainable cities. The results and findings follow in the next section of the paper.

RESULTS AND DISCUSSIONS

The results commence with the accessibility audit, followed by the perceptions of the interviewees on the interchanges. These are subsequently brought together and discussed.

Audit of the interchanges

The sections below provide information on aspects of the interchanges that were obtained through the use of the checklist. These include walkways and kerb ramps, traffic islands, footbridges, transit shelters and washrooms.

Walkways and Kerb Ramps

According to Ghana Standards Authority (2016), walkways must be firm, level and non-slippery with a minimum recommended width of 1.675 m to ideally allow two wheelchairs or scooters to pass by. Some walkways on the Interchanges, especially TMI, were quite narrow and did not meet this requirement (Figures. 5 - 7). For those that had widths of up to 4.2 m, parts of them were encroached by hawkers, refuse, pavement blocks, debris and open drains (Figure. 6). This situation is definitely inimical to the safety of PWDs, especially users of white canes, clutches and wheelchairs. This implies that, beyond adhering to the design standards provided, city managers and the highway authorities need to demonstrate an appreciation of the principles that informed the designs by decongesting these areas for the free movement of pedestrians.

Figure 5: Walkway covered by manhole

Figure 6: Unpaved Pedestrian Walkway with open*drains at TMI*

Figure 7: Walkway at TQI with open drains and uncovered manholes

Among other things, Henry (2009) stressed the provision of ramps to attain accessibility for PWDs. Kerb ramps are provided in road designs where there is a level difference between the pedestrian pathway and the surface of the road. Furthermore, they should be of non-slip materials, have a gentle slope, be provided at both ends of zebra crossings and be located such that they are well drained of rainwater and contain no manhole covers, storm gratings or other obstacles to free movement (GS 1119:2016 Subsection 2.1.3). The study revealed that kerb ramps, even where provided, were mostly on one side of the zebra crossings (Figures. 8 and 9).

Traffic/Refuge Islands and Pedestrian Crossings

Section 2.1.11 of GS 1119**:**2016, requires that traffic islands be provided at the requisite areas as safe havens for pedestrians. Crossings without refuge islands are not convenient for pedestrians; in many cases, they cross irregularly rather than wait for a vehicle to give them the priority (Mako and Szakonyi 2016) (Figures. 8 and 9). Yiing et. al (2017) asserted that all types of pedestrians prefer

Figure 8: Refuge island with kerb ramp (TQI)

Figure 9: Refuge island without kerb ramp (TMI)

The presence of refuge islands at signalised intersections and pedestrian crossings. Refuge islands should be at least 1.5 m wide and of materials and finishes that clearly distinguish them from the surrounding paving, especially for visually impaired persons. Apart from the footbridges and ramps, pedestrian crossings are the only means by which pedestrians can cross the interchanges. A pedestrian crossing that crosses a traffic island should be level with the main crossing or have kerb ramps, especially for persons with mobility challenges (United States Access Board, 2011). Refuge islands had been adequately provided at TQI and TMI and were in good condition but could not be accessed by PWDs due to the absence of kerb ramps (Figures. 10 and 11).

Figure 10: 42 cm high kerbs (arrowed)

Figure 11: Kerb ramp on only one side of road

pedestrian crossing at (TQI) with faded pedestrian crossing (TQI)

In section 5.5.1 of GS 1119:2016, provision is made for zebra crossings and pedestrian signals to help guarantee the safety and comfort of pedestrians, including PWDs. These should be designed in accordance with the Ghana Highway Code and should be provided with both audible and flashing crossing signals. For the sake of the elderly and PWDs, who will need more time to cross, there are to be pedestrian buttons mounted on poles and provision of tactile features among others. The study revealed that this was far from the reality because several of the pedestrian crossings, even where present, especially at TQI, had faded (Figure. 11) and pedestrians who avoided the use of the pedestrian bridges had to run across the roads to avoid being hit by speeding vehicles. PWDs found it difficult to cross these roads at these sections. This is a serious issue because, according to Kadzim (2012), PWDs normally felt safer crossing roads at marked crossings and pedestrian bridges. Mako and Szakonyi (2016) concluded that the two main driver errors at pedestrian crossings are speeding and not giving priority to pedestrians. WHO (2013) however, asserted that marked pedestrian crossings should not be implemented without additional safety measures. Pedestrians may falsely assume that they are safer and that motorists are more likely to see them and stop at marked

pedestrian crossings, and therefore attempt crossing without due caution, increasing their chance of being hit by a motor vehicle (Koepsell et. al., 2002). Furthermore, WHO (2013) reported that pedestrian-friendly road design is essential but not adequate to ensure pedestrian safety. Other facets related to perceived risk and road use behaviour must be well-thought-out and tackled, such as making streets more visually pleasing, widening sidewalks, isolating pedestrians from motor vehicles, providing street lighting, reducing vehicle speeds, and making streets safer from interpersonal violence.

Footbridges and Ramps

Sawyer and Bright (2007) emphasised the need to provide suitably designed and constructed ramps to all users of the built environment, especially PWDs. The TMI interchange has a footbridge comprising a staircase and a disability pedestrian ramp on each of its three legs with the fourth leg having only a disability pedestrian ramp. At TQI the footbridges have both staircases and disability ramps. Henry (2009) indicated that the provision of ramps, suitable toilets and handrails enhances the provision of accessibility to PWDs. The gradient of the ramps, finishes and handrails at TQI and TMI were in conformity with the Standards; the ramps had rough non-slip finishes with handrails above the minimum 0.865 m (Figures. 12 and 13) and the gradients were not steeper than 1:12 as stipulated by Ghana Standards Authority (2016) and Solidere (2004). While Cullen (2006) insisted that tactile surfaces are indispensable for the safe passage of partially and completely blind persons in the built environment, the Disability Standards for Accessible Public Transport (DSAPT) (2002) requires that tactile ground surface indicators must be installed on an access path to indicate stairways, ramps, changes of direction, overhead obstructions below a height of 2000 mm, and hazards within a circulation space or adjacent to a path of travel.

Figure 12: Motorbike riders on TQI

Figure 13: Disability pedestrian ramp enclosed by footbridge Ramp handrails on both sides (TMI*)*

Unfortunately, tactile surface indicators were completely absent at the two interchanges, and this will pose a potential harm to the blind since they will find it difficult to detect obstructions in their paths when using the interchanges. The lack of tactile surface indicators at the foot of the footbridges is further compounded by the presence of loose gravel and open drains (Figures. 14 and 15) at the entrance of some footbridges, which will make accessibility very cumbersome for the PWDs. Some motorbike riders use the ramp for crossing the road at the footbridge (Figure. 12) and this poses a big risk to PWDs who use the footbridge at TQI. The managers, law-enforcing agents, and other stakeholders of the interchanges should ensure the cessation of this unlawful practice since it poses a serious hazard to PWDs who use the ramps to cross the roads.

Figure 14: Entrance to a footbridge ramp at TMI with loose gravel and open drains gravel surface and open drains

Figure 15: Access to a staircase at TMI with loos*e*

Signage, Lighting and Traffic Signals

The GS 1119:2016 Standard requires that comprehensive exterior signage and wayfinding systems be provided to assist users in locating appropriate facilities and finding their way (Section 2.5.4). These should be of appropriate letter sizes and located at appropriate heights (Figure. 16). At the interchanges, aside from the challenge of selective provision, there was evidence of poor maintenance culture where some damaged or missing signs were yet to be replaced. Secondly, some pedestrian crossings were faded, putting pedestrians, especially PWDs, at risk (Figures 11 and 17). The international disability symbol, which is used to convey the needs of PWDs in signage, was completely missing at the two interchanges.

Figure 16: Signage at TMI in a relatively better state

Figure 17: Damaged signpost and faded Pedestrian crossing (TQI)

According to Road Planning and Design Manual (2004), the objective of major road lighting is to provide a lighted environment that is conducive to the safe and comfortable movement of vehicular and pedestrian traffic at night. However, the visual requirements of the motorist predominate. To accomplish this, the lighting should reveal necessary visual information. This will consist of the alignment of the road ahead, kerbs, footpaths, road furniture and surface imperfections, together with other road users, including pedestrians, cyclists and vehicles, and their movements, and any other animate or inanimate obstacles (Department of Transport and Main Roads, Queensland Government., 2021). Adequate provision had been made for street lighting at TQI and TMI but their maintenance was lacking especially at TQI where some of the lights were not functioning at the time of the study. This made the use of such places quite dangerous for PWDs during dark periods especially those with various degrees of visual impairments. TMI was relatively better and well-lit at night (Figure. 18 and 20).

Figure 18: Streetlights at TMI

Figure 19: Traffic Signal at TMI

Figure 20: Footbridge and Streetlights at TQI

Oskarbski *et al*. (2016) noted that traffic signals/lights are one of the most effective means of controlling traffic and are used to segregate colliding traffic movements at intersections and a very critical element of pedestrians' service at the signalised intersection is to give them sufficient time to pass a pedestrian crossing. Their design is contingent upon two important parameters, namely the speed and volume of pedestrians and vehicles and pedestrian commuting plays an important role for various people, including some vulnerable groups such as the elderly and children with PWDs. Traffic signals at the two interchanges were also in a satisfactory state at the time of the study (Figure. 19). From the foregoing, the TMI was more accessible than the TQI as far as signage, street lights and traffic lights are concerned. Beyond their provision, the management and maintenance of these three elements at the two interchanges ought to be seriously considered by the relevant stakeholders to avoid further deterioration and inaccessibility of the interchanges since three factors of road traffic, that is human-vehicle-infrastructure are mutually responsible for complementing each other in ensuring road safety (Mako and Szankonyi, 2016).

Bus Stops and Parking Spaces

Among other requirements, pedestrians should have unobstructed access to Bus Stops and an access ramp to bus stops is required if the boarding point is not at the same level as the access path. The Bus Stop should have a flat, firm, non-slip, non-Figureured surface at the point of boarding

with a minimum kerb height of 150 mm. Shelter structure if provided, should not obstruct access paths and walkways and must be fitted with a minimum light level of 150 lux, a Bus Stop sign and a Tactile Ground Surface Indicator. 5% of seats (minimum of 2) to be identified as priority seating for PWDs (DSAPT, 2002; Australian Human Rights Commission Accessible Bus Stops Guidelines, 2010). The two interchanges had few bus shelters and car parks/parking spaces but they all had firm, level and well-drained bases as required by GS 1119:2016 section (2.2.2). However, some bus shelters had raised platforms (Figure. 21), making them inaccessible to wheelchair users**.** Lacey (2004) emphasised that accessible parking spaces are imperative because cars are sometimes the only practical transport system for some disabled people. Bezzina and Spiteri (2005) and BS8300 -2 (2018) stated that car parking and setting down are important activities at the beginning or the end of journeys. Solidere (2004) identified the main problems with the provision of parking spaces as poor parking facilities, insufficient width of the parking aisle and no allocation of parking space for the disabled.

Figure 21: A bus shelter at TQI with a raised platform of 0.4m

Unfortunately, there were no dedicated parking spaces around the interchanges for parking vehicles apart from the few bus shelters provided. This meant that drivers and pedestrians, especially PWDs commuting in private vehicles, would not easily get a place to park their vehicles, alight and transfer vehicles.

Washrooms

There were no washrooms for both non-disabled and disabled pedestrians at the two interchanges and the entire stretch of the 19 km Motorway. This is not very different from a developed country such as the UK, where Bichard *et al*. (2020) reported that, although the UK had some public toilets, they were not accessible to PWDs. Imrie and Kumar (1998) noted that many PWDs associate their homes with safety and security but the external built environment of the home is synonymous with hazards. Mostly for persons suffering from moods of confusion and loss of way-finding ability, may restrict themselves to aggravating their feelings of loneliness and compounding their autonomy (Blackman, 2003). An inaccessible built environment may be problematic for PWDs and, as Goldsmith (1976, p. 22) pointed out, this could lead to a crisis at public lavatories.

He has further noted that the accessibility of public lavatories is very critical to PWDs compared to any other building type. The Standards, including the Solidere (2004), identified the main planning principle in the provision of washrooms for PWDs in the built environment as ensuring sufficient accessible space inside washrooms, with all fixtures and fittings being within easy reach.

Road /Street Furniture

Street furniture consists of items such as crash barriers, rubbish bins, planter boxes, public seats/benches, telephone booths, bollards, gates, lamp posts, fire hydrants, direction and street signs etc. that are normally located on both vehicular and pedestrian routes. Per GS 1119:2016, all public pedestrian routes should be designed to ensure the safety and comfort of all persons regardless of age or ability (section 2.1.11). Some essential street furniture such as rubbish bins, public benches and telephone booths was virtually absent from both TQI and TMI. As mentioned earlier, other types of street furniture such as signage, traffic lights, street lights and crash barriers (Figures. 22 and 23) were poorly maintained and in a state of disrepair especially at TQI and this calls into question the culture of maintenance of the relevant state institutions and stakeholders. Facilities that ensure accessibility of PWDs to the interchanges may be provided, but may be of little or no use if not properly maintained.

Figure 22: Various road furniture in relatively

Figure. 23 Damaged and mangled crash *good condition at the TMI barrier at TQI*

From the audit, it can be concluded that there have been some attempts to make the interchanges accessible but they have not been far reaching or holistic in line with the accessibility standards.

Interviews

By the exclusion and inclusion criteria developed, four Engineers from the Metropolitan and District Assemblies, one from the Ghana Highway Authority (GHA), one from the Ministry of Roads and Highways and two from the private consulting firm that supervised the construction of the interchanges were interviewed in addition to a representative from the GFD (Table1).

Table 1: Interview Participants

S/No	Organisation	Position of respondent	Role of the Organisation	Mode of Interview
1	Metropolitan/District Assembly I	Civil Engineer	Stakeholder/Client Representative	Face-to-face
2	Metropolitan/District Assembly I	Civil Engineer	Stakeholder/Client Representative	Face-to-face
3	Metropolitan/District Assembly II	Civil Engineer	Stakeholder/Client Representative	Face-to-face/ phone
4	Metropolitan/District Assembly II	Civil Engineer	Stakeholder/Client Representative	Face-to-face
5	Ghana Highway Authority	Civil Engineer	Stakeholder/Client Representative	Face-to-face/ phone
6	Ministry of Roads and Highways	Civil Engineer	Stakeholder/Client Representative	Phone
7	Private Consulting Firm	Civil Engineer	Design Team/ Supervising Team	Face-to-face
8	Private Consulting Firm	Civil Engineer	Design Team/ Supervising Team	Face-to-face / phone
9	Ghana Federation of the Disabled	Coordinator	Disability Organisation	Face-to-face

The representative from the GFD was of the view that the interchanges did not measure up to the requirements of Section 23 of the Persons with Disability Act 715 which stipulates that *'…Ministries responsible for rail, air, and road transport and where appropriate the Ministry of Local Government shall ensure that the needs of persons with disability are taken into account in the design, construction and operation of the transportation network'* (2006, p7).

He wondered why such an important stakeholder group was not consulted for inputs on any aspect of the design, construction and management of the interchanges. Often, their concerns only come to the limelight when on their own volition, they express concerns about the unfriendly nature of buildings and other related public infrastructural facilities. On the interchanges specifically, he noted that there was a false impression that the needs of PWDs were captured. He said what was done addressed some accessibility issues and was skewed toward the challenges of persons with mobility impairments.

It was gathered from the Engineers at the Assemblies that, their respective Assemblies together with the Ghana Highways Authority (GHA), usually took the relevant decisions on the needs of PWDs during the construction of the interchanges but external donors like JICA were also invited when the latter provided the funding for the projects. The purpose of a road would normally dictate what facilities need to be provided. However, one professional noted that it was the final decision on the designs that rested with the Client, even though as professionals, they could make suggestions for the Client's

consideration. The construction team would usually include the following: Bridge Engineer, Environment Engineer, Drainage Engineer, Geomatic Engineer, Geotechnical Engineer, Safety Engineer, Traffic Engineer, Highway Engineer and Quantity Surveyor who would be guided by professional standards and manuals in their activities. One Engineer noted:

"There are design manuals which the design team followed in the designing of the interchanges to suit persons with disabilities but in all this, the client's needs and resources outweigh the requirements of the manuals and reports." (Paul, 2022, personal communication, 10 August).

Another Engineer was emphatic that the needs of PWDs were catered for due to the existence of requisite legislation in the country. A third Engineer from one of the Assemblies added that the needs of PWDs were captured by the provision of ramps. He was confident that PWDs would be safe if they kept to the safe points while crossing the roads. However, he subtly avoided the response to a question on whether the PWDs were consulted during the design stages of the interchanges. This is a likely indication that PWDs were not consulted. Professionals from the private consulting firm, however, admitted that the needs of PWDs were not amply catered for in the design and construction of the interchanges, and that they only received complaints from PWDs through news bulletins about the inaccessibility of the interchanges.

Another critical problem was the issue of the maintenance of the facilities, which was believed to impact the accessibility of the interchanges. One of the Engineers said,

"Bus stops, road signs, street lights, curb ramps, pedestrian bridges, handrails, walkways and pedestrian crossings were situated on the interchange. Some of these facilities may not be present or may not be useful due to poor maintenance by the Client." (Kofi, 2022, personal communication, 18 August).

Another confirmed that there were maintenance challenges that resulted in inaccessible facilities: *"The disabled pedestrian finds it difficult to use facilities due to their poor state."* (Paul, 2022, personal communication, 10 August).

A third Engineer was explicit that, *"The disabled persons find it difficult to use the facilities because they are poorly maintained."* (John, 2022, personal communication, 17 August).

An Engineer (Paul, 2022, personal communication, 10 August) noted that there had been several requests from Disability Associations but the usual bottleneck is that, *"The government has funding challenges."* It was confirmed at the supervisory ministry that financial constraints from inadequate budg*et al*locations for such projects could lead to situations of partial provision of accessible facilities. In sum, although there were professional expertise and accessibility laws supported by manuals, the state of the interchanges in terms of accessibility to PWDs was constrained by the dictates of the Client, the maintenance culture and the availability of funds. The inputs of PWD organisations were also not manifestly sought during the design, construction and management of such interchanges.

From the findings of Danso and Tudzi (2015), most professionals who worked on some of the earlier interchanges in the country could not confirm the inclusiveness of their designs**.** However, the Consultants who designed and supervised the construction of the two interchanges especially the TMI, asserted that the accessibility needs of PWDs were factored into the designs. Nonetheless, while for some consultants, accessibility

meant the provision of ramps, others saw funding challenges as factors that had eroded the interchanges of the full complement of their accessibility and inclusivity. This agrees with the perspective of Katzmann (2010) that the comfort and accessibility of citizens are sometimes traded for cost-saving measures. However, since accessible environments are now a matter of right and a developmental issue, there is no justifiable reason why the cost implications should not be factored into projects from the very onset. From the checklist assessment, it was apparent that the accessibility provisions made for the two interchanges were not adequate. This was corroborated by the representative of the PWD association. Though various legislation like the Persons with Disability Act 715, the Accessibility Standards GS1119 and other construction manuals are creating awareness of the provision for accessible facilities like interchanges in the public space, the impact is quite minimal and appears to be skewed mainly towards the accessibility needs of persons with mobility impairments. Secondly, the audit also showed that some provisions required by the Standards were absent, partially provided or poorly maintained. An example of the latter was the provision of kerb ramps at one end of zebra crossings instead of both ends. This also confirms the view that in a few countries in Africa, Central and Southern America and parts of Asia, where accessibility codes exist, they fail to make much impact because of a lack of enforcement and monitoring (UNAPD, 2010). This is confirmed by the evidence from the audit, where street lighting, signage, fading zebra crossing markings, and access points of ramps which had seen evidence of wear and tear, had not been attended to at the time of the study. This confirms the findings of numerous studies on the poor maintenance culture of the Ghanaian (Wuni, *et al*, 2017; Ampofo, 2020; Ampofo *et al*, 2020; Amponsah-Kwatiah *et al*, 2021). It means beyond design, construction and supervision of the interchanges, proper maintenance management practices and a positive maintenance culture by the citizenry and organisations will be a relevant complement to help ensure accessible and inclusive interchanges. The state machinery ought to ensure that systems in place to see to enforcement are playing their roles. Else, accessible built environments risk being a mirage and not seeing full fruition by the expected date of 2030, which is less than 10 years away. Muhammad and Ibrahim (2021) advocated for stakeholder involvement in the development process of interchanges to provide better facility construction and management. The results of the study, however, point to a contrary situation. This raises concerns about whether the relevant stakeholders, especially users of public infrastructure such as interchanges, are consulted for their design, construction and management. To cure such occurrences, the relevant Authorities, Agencies and Professionals should endeavour to carry out the relevant stakeholder consultations to ensure that the needs of the PWDs which is a human rights issue (WHO, 2011), are incorporated at the project conception and design stages. Continuous public education, continuing professional development activities by relevant professional bodies and advocacy are key in this regard.

Implications

The study has revealed that although the professionals averred that the accessibility needs of PWDs were factored into the design, construction and management of the interchanges, the audit and the perspectives of the PWDs pointed to the fact that the interchanges still had accessibility challenges. Theoretically, the study affirms the position of the social model of disability. In terms of policy implications, the findings suggest the need for policy that will insist that

projects on interchanges provide evidence of incorporating perspectives of PWDs and designs fully adhering to the country's accessibility standard before being handed over and commissioned. Methodically, the implications are that the method used may be replicated in other studies on other interchanges and this can broaden the discussions on the subject matter. Ethically and socially, the study suggests that even though there is a cliché, to 'leave no one behind', this does not appear to be the situation in light of interchanges and thus implicitly infringes upon the rights of PWDs. Our communities and society as a whole may still be creating barriers for PWDs. Finally, the results may be practically factored into decisions of consultants and clients involved in the construction of interchanges if there is a real commitment to creating an accessible society.

CONCLUSION AND RECOMMENDATIONS

The findings of this study on the accessibility of the two motorway interchanges in Accra shed light on the state of these interchanges concerning legislation on the built environment in Ghana. This study concludes that there has been little progress in the implementation of protocols, policies and laws related to accessible and inclusive built environments in Ghana over the past decade as evidenced from the findings of this study. It confirms the findings of a previous study conducted by Danso and Tudzi (2015) on other interchanges in the country, which highlighted the significant gap between the state of the interchanges and the required features of accessible interchanges. Therefore, despite the existing manuals, protocols, policies, and laws on accessibility, the actual implementation of these measures in the design, construction, and management of highway interchanges is subject to the dictates of Clients, budgetary allocations and maintenance management practices. The perspectives of key stakeholder groups like PWDs are usually not sought. This disparity raises concerns about the effectiveness of current efforts to ensure inclusivity and accessibility for PWDs. Should this trend continue, it will undermine the objective of '*leaving no one behind*' and also militate against the laudable objectives of providing accessible interchanges in the country. Policy decisions should focus on parameters that will guarantee the enforcement of accessible and inclusive conditions in the design, construction and management of interchanges and the involvement of key stakeholders in such decisions. This is in consonance with Article 9(2) *of the UN CRPD which notes that States Parties shall take appropriate measures to … monitor the implementation of minimum standards and guidelines for the accessibility of facilities and services open or provided to the public.* Accordingly, further studies are advocated to look into the determinants of ultimate decisions on public construction projects and also on maintenance management practices of interchanges so as to further influence policy direction on interchanges and foster the development of effective strategies for ensuring accessibility and inclusivity in future infrastructure projects. The findings of the study are limited to the geographical scope, the case study and the period within which the research was undertaken.

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