ACCESSIBILITY OF PEDESTRIAN INFRASTRUCTURE ALONG ARTERIAL ROADS TO PERSONS WITH DISABILITIES IN KUMASI

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ABSTRACT
The rights of Persons with Disabilities (PWDs) to accessible built environments include the convenient and safe use of roads and pedestrian infrastructure. This is founded on the United Nations Convention on the Rights of Persons with Disabilities and other related international and local legislation. These notwithstanding, this paper sought to ascertain whether the accessibility needs of PWDs were amply factored into decisions on pedestrian infrastructure. The study adopted a descriptive research design. It involved the use of a checklist developed from the Accessible Side-walks and Street Crossing information guide and the Ghana Accessibility Standards for the Built Environment to assess pedestrian infrastructure along five arterial roads leading to Kumasi, the second most populous city in Ghana. Interviews were also used to ascertain the opinions of 122 PWDs on the inclusiveness of the pedestrian infrastructure. The study found that the pedestrian infrastructure was not as inclusive as required. Maintenance was not given due attention and most PWDs had challenges with the pedestrian infrastructure. The study concludes that irrespective of the prevalence of both international and local standards in Ghana, the accessibility needs of PWDs are not amply factored into decisions on pedestrian infrastructure. Accordingly, policy should dwell on holistic enforcement of the accessibility standards in design, construction and maintenance. These will support

the quest to enhance accessible transport systems and consequently efforts towards achieving Sustainable Development Goal 11.

Keywords: Accessibility, Maintenance, Kumasi, Persons with Disabilities, Pedestrian infrastructure, Sustainable Development Goal 11.

INTRODUCTION

The principle of leaving no one behind as espoused in the United Nations Agenda for Sustainable Development asserts that a lot of the barriers people face regarding accessibility and equal opportunities are the result of discriminatory laws, policies and social practices that leave particular groups of people further and further behind (United Nations Sustainable Development Group, 2023). Hence according to Target 11.2 of Sustainable Development Goal 11, by 2030, there should be safe, affordable, accessible and sustainable transport systems for all. Road safety is to be improved by giving special attention to the needs of those in vulnerable situations, like Persons with Disabilities (PWDs) (Anke, 2019). This aligns with Article 9 of the United Nations Convention on the Rights of Persons with Disabilities (CRPD) which encourages member states/parties to ensure assessable built environments including transport systems. The United Nations Department of Economic and Social Affairs-Social Inclusion (2023, p. 11) makes a positive statement that disabling barriers can be overcome.

Over forty African countries have ratified the CRPD indicating a commitment to ensuring inclusiveness (United Nations Human Rights Treaty Bodies, 2023). Some like South Africa, Nigeria and Ghana have disability acts and standards. South Africa for instance has the National Strategic Framework on Universal Design and Access which aims among others to integrate universal design and access into all systems; and to accelerate the removal of barriers to access and participation (Department of Women, Youth and Persons with Disabilities, 2021). Nigeria has passed the Discrimination Against Persons with Disabilities (Prohibition) Act (2018). Ghana's Constitution, beyond guaranteeing the basic freedoms and human rights to all citizens including PWDs, further devotes Article 29 specifically to PWDs. This is further supported by the Persons with Disability Act, 2006 (Act 715) and the Accessibility Standards for the Built Environment (2016) (GS1119:2016) which are all targeted at ensuring inclusiveness.

Nevertheless, Disability Africa (2018) underscores the prevalence of exclusion in Africa even in the face of 'leaving no one behind'. Transport challenges and inaccessible built environments are cited among others. The World Health Organization-Africa Region (2023) notes that between 110 million and 190 million adults have significant difficulties in functioning and that the rates of disability are increasing. This means that the need to devote proper attention to the needs of PWDs cannot be an overstatement. The United Nations Department of Economic and Social Affairs-Social Inclusion (2023) avers that the CRPD requires a shift from traditional ways of looking at disability as an individual impairment to a focus on State obligations to create enabling environments that promote inclusiveness. It

affirms that disability is both a development and human rights issue which accordingly cannot be glossed over. United Nations Division for Social Policy Development (n.d.) also asserts that attitudinal and environmental barriers to participation have profound social, economic and cultural effects on PWDs, resulting in exclusion.

Transportation is critical for socioeconomic development (Boateng et al., 2022). Hence various forms of infrastructure like airports, seaports, railways, and roads have been constructed to enhance transportation. Transportation and mobility are pivotal to sustainable development (SDG 11). Transportation is linked with poverty and hence an important area for consideration in a quest to achieve the SDGs (Venter, et al., 2002; United Nations, 2016). Similarly, disability is also linked with poverty which again raises the need to address issues of disability in the quest to achieve the SDGs (Graham et al., 2013; CRPD, 2006). The nexus between transportation and disability is accordingly worthy of study. Unsurprisingly, the CRPD, various international enactments and standards like the Americans with Disabilities Act (ADA) (1990) and its Accessibility Standards (United States Department of Justice, 2010), stress the need for decisions on transportation to consider the accessibility of PWDs. The United States Department of Transportation (n.d.) for instance has come up with an Accessible Side-walks and Street Crossing information guide (FHWA-SA03-1) to help guarantee the comfort and safety of pedestrians including PWDs. Indeed, Kett et al. (2020) advocate a shift to inclusion by planners looking at access from a holistic perspective and also as a right. According to Rasouli & Tsotsos (2019) pedestrians are key users of roads hence their needs ought not to be glossed over in transportation decisions. This paper argues that irrespective of the preponderance of legislation and related standards both internationally and locally in Ghana, the accessibility needs of PWDs are not amply factored into decisions on pedestrian infrastructure.

In many countries in Africa, efforts to guarantee the rights of PWDs are hampered by several barriers, some of which are socio-cultural while others are physical. In some of these countries, there is a perception that disability is a sign of a bad omen which calls for a mental and behavioural reorientation (Mfoafo-M'Carthy et al., 2020). There is the medical perspective of disability which is being dealt with by medical prescriptions. However, the physical barriers that are created by society (social model) are being dealt with by various legislation and policies supported by standards to ensure accessibility through universal designs (WHO, 2011; UNICEF, 2013). Nonetheless, Zajac (2017) notes that in the quest to enhance the accessibility of transport conditions for PWDs, there are differences in local standards and calls for a universal design.

With disability being a human rights and development issue, the legislative framework in Ghana seeks to guarantee the provision of accessible built environments for PWDs which compare very well with similar ones in developed countries. However, the literature amply indicates that there are challenges to enforcing various rights of PWDs in Ghana (M'Carthy et al., 2020). Article 29 of the Constitution guarantees the rights of PWDs to social inclusiveness, access and non-

discrimination. Article 29(6) notes that "*as far as practicable, every place to which the public has access should be appropriate facilities for the disabled'.* This includes transportation facilities*.* This is further buttressed by Act 715 which states in Section 23 that *Ministries responsible for rail, air, and road transport and where appropriate, the Ministry of Local Government shall ensure that the needs of PWDs are taken into account in the design, construction and operation of the transportation network.* Ghana's National Transport Policy (2020) notes that 20 percent of Ghana's population is estimated to be living with a physical, intellectual or emotional disability and accessibility to transport services is key to their active and unrestricted access to the benefits of Ghanaian citizenship. Side-walks are very important in city life. Safe accessible and well-maintained side-walks enhance public health and maximize social capital. The provision of street crossings at appropriate points enables pedestrians to move safely across streets (NACTO, 2023). Accessible road and pedestrian infrastructure being part of the built environment are essential for guaranteeing the rights of PWDs.

The GS 1119:2016 elaborately provides information on how accessible side-walks, street crossings and other road and pedestrian infrastructure should be for the sake of PWDs. This notwithstanding, there is little known about the provision for accessible side-walks, street crossings and other pedestrian infrastructure along arterial roads in Kumasi. This study sought to fill this gap. The objectives were to assess the inclusiveness of pedestrian infrastructure along the roads using a checklist and to find out the opinions of PWDs who use the selected roads. It proceeds with information on Kumasi, the research methodology, the results and discussions, and then the conclusion.

METHODS

Kumasi, the study area is Ghana's second largest city located within Latitudes 6 35" N and 6 40" N and Longitudes 1 30" W and 1 35" W and the capital of the Ashanti region. Its location enhances movement to any destination in the country. Indeed, it serves as a bulk breaking centre for several commodities. It is an important transit point for the landlocked Sahelian countries that need to use the seaports of Ghana. Most important transportation routes within the country converge in the city hence making it play a critical role as a transport interchange point in Ghana (Adarkwa, 2011; Cobbinah et al., 2020).

Its central market found within the Central Business District (CBD) is the largest in West Africa and further enhances commuting to and from the city. Furthermore, the Komfo Anokye Teaching Hospital which is a tertiary institution provides health services to patients from other parts of the country and countries in West Africa. The Suame Magazine Industrial Development Organization is also a major centre for making vehicle parts and the repair of vehicles from various parts of the country and beyond. Kumasi is also the home of the Golden Stool and the seat of the Asantehene. These, together with the rich Asante culture, festivals, and various interesting sites attract a lot of tourists to the city hence making the use of transport facilities critical and inevitable (Adarkwa, 2011; Cobbinah et al., 2020).

Per the latest population and housing census in Ghana, the Ashanti region has the highest number of PWDs in the country (363,321). This is followed by the Greater Accra region (282,719) where the national capital is located. The census captured persons with sight, hearing, physical, intellectual, self-care, and speech challenges. In this regard, almost 8 percent of Ghana's population aged 5 years and above are PWDs. The percentage of females is about 2.1 percent higher than that of males. The national pattern is replicated in the Ashanti Region with the regional situation being a bit higher (2.3 percent) in favour of the women (Table 1). With the highest proportion of PWDs being in Ashanti, a study on PWD accessibility within Kumasi, its capital, is deemed to be apt.

Table 1: Population 5 Years and Older with Disabilities

	All regions		**Ashanti Region**	
Both sexes	Freq	%	Freq.	%
Total	26,986,540	100	4,788,598	100
Persons without Disabilities	24,888,402	92.2	4,425,277	92.4
Persons with Disabilities	2,098,138	7.8	363,321	7.6
Male				
Total	13,250,624	100	2,348,261	100
Persons without Disabilities	12,366,518	93.3	2,197,703	93.6
Persons with Disabilities	884,106	6.7	150,558	6.4
Female				
Total	13,735,916	100	2,440,337	100
Persons without Disabilities	12,521,884	91.2	2,227,574	91.3
Persons with Disabilities	1,214,032	8.8	212,763	8.7

Source*:* Ghana Statistical Service (2021)

The main means of transport within the city is by road transport. The city has a functioning airport but rail transport has been suspended. Major roads from Kumasi include those leading to Accra, Sunyani, Mampong, Obuasi, and Bibiani. Traffic congestion is a major challenge identified on major arterial roads within the city's transport system (Adarkwa & Poku-Boansi, 2011; Cobbinah et al. 2020). A search on transportation in Kumasi, with emphasis on accessibility for PWDs yielded 14 articles but none dwelt on accessibility for PWDs at side-walks, road crossings and other pedestrian infrastructure (Appendix 1).

Ocran (2022) dealt with structural dimensions of discrimination toward PWDs; Obiri-Yeboah et al. (2022) addressed the economic impact of rickshaws; Acheampong and Asabre (2022) studied place-based accessibility and found out that accessibility was poor due to congestion (2022); Boateng et al. (2022) looked at the relationship

between transportation and economic development and concluded among others that traffic congestion and reckless driving were major challenges; Anabire (2021) whose study was gender-related concluded that men had greater access to technologies of mobility than women. Obiri-Yeboah et al. (2020) also in their study on friction agents contributing to road congestion identified vendors and pedestrians among others. Cobbinah et al. (2020) who looked at the cityscape of Kumasi expressed concerns about distortions in planning systems and deteriorating infrastructure and services. Yeboah & Asibey (2019, p811) looked at the effects of decisions on planning and transportation infrastructure on Kumasi, land use, growth, and form. Though they touched on disability, they did not emphasize accessibility for PWDs. They noted,

> *A review of current policies reveals that transport proposals of Kumasi are geared towards ensuring economic development with limited attention to social well-being. For instance, pedestrian safety, disability-friendly infrastructure, and non-motorized transport within slums have received less attention*.

The closest to the focus of the current study was Danso et al. (2019) which dealt with transportation infrastructure in Kumasi with PWDs in view albeit it focused on the Sofoline interchange and concluded that there were accessibility challenges. Owusu-Ansah et al. (2018) looked at accessibility within the CBD and concluded that there were serious challenges. Kleager (2017) dealt with the risks along the Kumasi-Accra road that resulted in the construction of a bypass to avoid certain towns where accidents had been frequently occurring. In 2017 the study of Cobbinah & Aboagye within a peri-urban area concluded that urban sprawl had both spatial and aspatial characteristics and that basic infrastructural facilities were absent in the area. Finally, Danso et al. (2017) also undertook a study in the CBD and the perceptions of the PWDs involved in the study were that the CBD was inaccessible. They accordingly called for redesigning facilities for the sake of PWDs and enforcing the relevant laws to make the CBD accessible.

A descriptive research design was adopted to identify and record the characteristics of the phenomenon under study (Manjunatha, 2019; Ansari et al., 2022). It involved examining major roads radiating from the city centre to ascertain their level of accessibility with specific emphasis on the state of side-walks, street crossings and other pedestrian infrastructure. These were purposively selected. They were the Adum-Tanoso road which leads to Sunyani; the Adum-Pankronu road (IR4) which leads to Ejura and Atebubu; the Adum-Kronom road (N10) which leads to Techiman, Kintampo, Tamale and the Sahelian countries; the Adum-Oduom road (N6) which leads to Accra, the capital of Ghana and the Adum-Kokoben road (N8) which leads to Obuasi, a major mining town in Ghana (Figures. 1&2). These were purposively selected because they were the major arterial roads leading from the CBD of Kumasi to major towns within the country. The study covered 8 kilometres (5 miles) from the cenotaph at the centre of the CBD along each of the roads.

Figure 1: Google map showing studied roads I
Source: Google Maps (https://www.google.com/maps/@6.6756657,-1.6210378,10z?entry=ttu), 2023

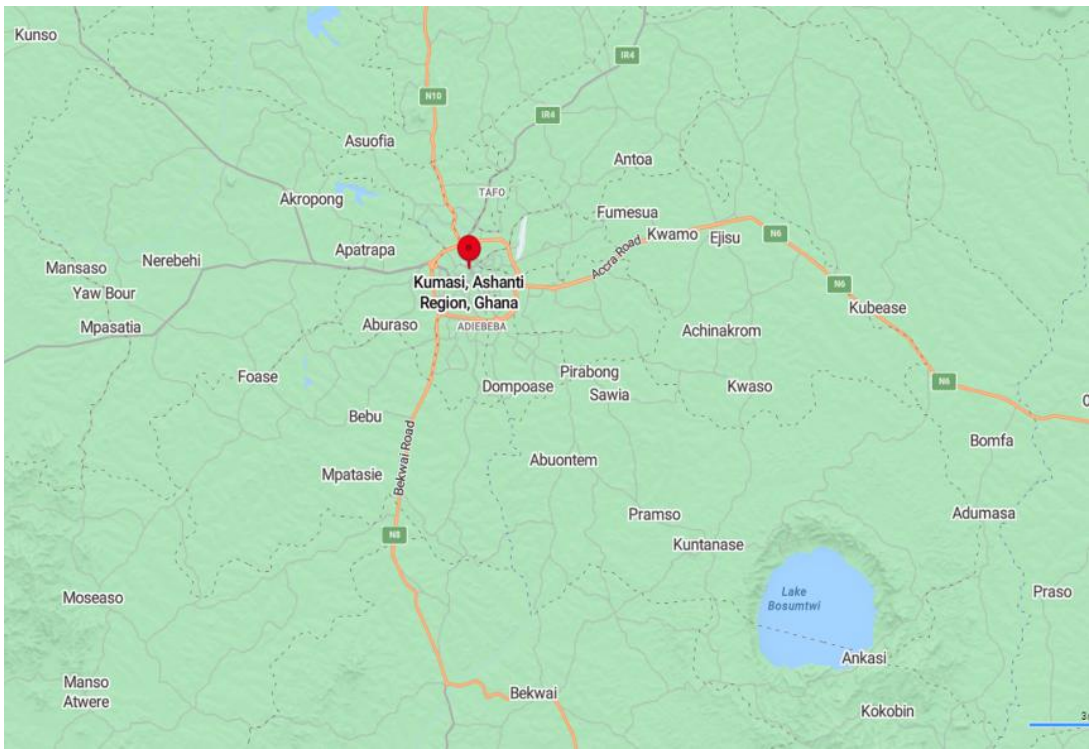

Figure 2: Google map showing studied roads II

Source: Google Maps (https://www.google.com/maps/@6.6756657,-1.6210378,10z?entry=ttu), 2023

Using the snowball and accidental sampling approaches, the researchers identified 122 PWDs who use the roads. Primary data was obtained from the PWDs using interview guides which were administered by research assistants who were students at the College of Art and Built Environment (Kwame Nkrumah University of Science and Technology, Kumasi) who had acquired requisite knowledge about disability access as part of their education. The data was gathered from November 2022 to February 2023. The interview guide sought to obtain demographic information about the interviewees and their opinions on pedestrian infrastructure. Beyond their gender, age and type of disability, the interviews sought to ascertain major challenges PWDs encountered, if any, regarding the state of the pedestrian infrastructure and ease of use.

A checklist emphasizing requirements of accessible side-walks, street crossings and other pedestrian infrastructure developed from the FHWA-SA03-1 and the GS1119:2016 was used for the assessment of the roads. Key issues checked included the following requirements:

- Both audible and flushing road crossing signals are to be provided.
- The audio pedestrian signals should be loud enough to be heard clearly above the ambient noise.
- Two different audio signals, identifying when it is safe to cross either direction are required for persons with visual difficulties.
- Where extended time is required to cross, a marked pedestrian button should be made available and mounted on a pole beside the cut kerb.
- The floor or ground surface shall be 760 mm by 1220 mm minimum.
- Where traffic islands are required, they should be built of materials or finishes that are easily distinguishable from the surrounding paving.
- Pedestrian zebra crossing (cross walks) that cross a traffic island should be level with the main crossing or have kerb ramps.
- Traffic islands should be at least 1500 mm wide (1980 mm is preferred).
- All drains should be covered.
- In situations where accessible routes cross into vehicular routes, crossings with suitable kerb ramps identified with bright yellow or white lines and/or distinct paving should be provided.
- All routes should be free of protruding obstacles, overhanging signs, etc.
- All paths/side-walks for pedestrians and persons with mobility aids must be firm, level, and of non-slip materials and are recommended to be of minimum of 1675 mm wide
- They should ideally have a minimum gradient of 1:20 (5%)

The GS 1119: 2016 goes further to provide various figures as a guide for how acceptable designs should be at street crossings and side-walks. For example, Figure 3 indicates an ideal kerb ramp on a public thoroughfare.

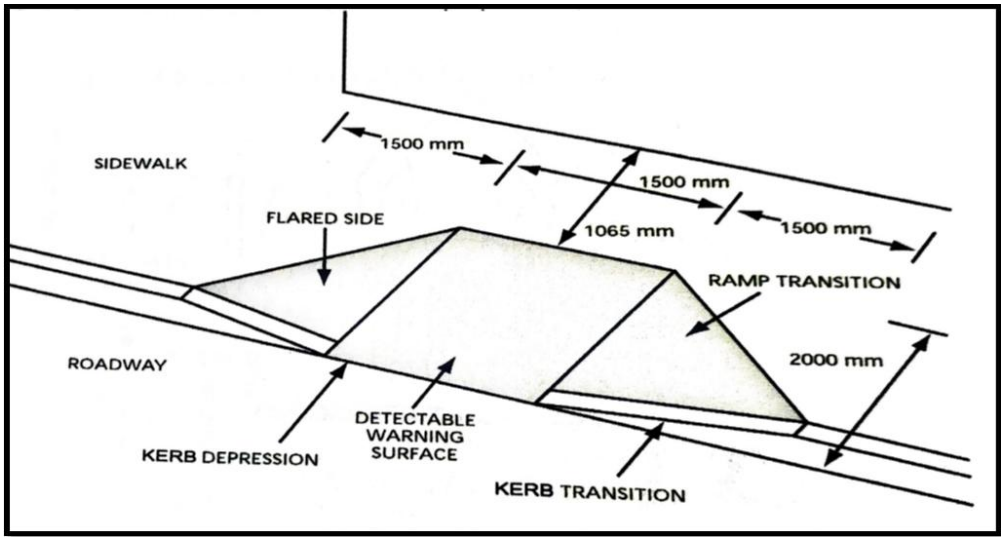

Figure 3: Kerb ramp on a public thoroughfare
Source: GS1119: 2016

The data collected was checked to ensure completeness, accuracy, and consistency for purposes of data validation (Loo & Jonge, 2020). For quantitative data analysis, STATA version 15 was used to perform percentages, frequencies and chi-square with the p-values. The qualitative data was coded and analysed manually. Deductive coding was used and it was supported by a hierarchical coding frame. The main themes related to the availability of various pedestrian infrastructure. The sub-themes related to accessibility to the PWDs or otherwise. These were adapted from Danso & Tudzi (2015). Beyond these were emergent themes that dealt with the experiences of the PWDs.

For ethical purposes, they were informed about the purpose of the interaction and told that participation was voluntary. Accordingly, they had the right to refuse to answer any particular question or even refuse to continue participating in the study at any point in time. Their identities were not to be disclosed and their utmost confidentiality was going to be guaranteed. Participation was to be at no cost to them and was devoid of any form of compulsion. Accordingly, pseudo names were to be used in the text if as of necessity, someone had to be referred to. The participants were made to understand that involvement was an act of beneficence and that no compensation would accrue to them for participation. Following this, the oral consent of each participant was secured before the exercise. The next section provides demographic data on the PWDs, their experiences and the state of pedestrian infrastructure in the study area regarding accessibility for PWDs.

RESULTS AND DISCUSSIONS

Opinions of PWDs who use the selected roads

Most of the PWDs who availed themselves to participate in the study through the chosen methodology were males (63.93%) even though the population of males and females in Ghana is almost equal as per the latest population census (GSS,2023) (Table 2). Nonetheless, the dominance of males is consistent with the participation

of the various sexes of PWDs in similar studies. The gender of the respondents is not statistically associated with road corridors (p-value =0.74).

Table 2: Gender of PWDs

Road Corridor	Distance Covered	Major Destination	Male		Female		Total		Chi-square (P-value)
			Freq	%	Freq	%	Freq	%	
Adum-Tanoso	8 km	Sunyani	7	8.97	2	4.55	9	100	2.01(0.74)
Adum-Pankronu	8 km	Mampong	20	25.64	15	34.09	35	100	
Adum-Oduom	8 km	Accra	25	32.06	15	34.09	40	100	
Adum-Kronum	8 km	Tamale	20	25.64	10	22.72	30	100	
Adum-Kokoben	8 km	Obuasi	6	7.69	2	4.55	8	100	
		Total	**78**	**100**	**44**	**100**	**122**		

Regarding the type of disability, a greater number of participants (52.46%) were persons with mobility challenges like users of wheelchairs, clippers, and other assistive devices though persons with visual impairments are in the majority in Ghana (Table 3). The predominance of persons with mobility challenges in such studies is also well-established in the literature. Those with visual challenges came next (33.61%) followed by those with speech impairments (12.29%). The last category was made up of those with more than one type of disability (1.64%). It was observed that the type of disability of the respondents is not statistically associated with road corridors (p-value =0.32).

Table 3: Type of Disability

	Mobility		Visual		Speech		Others		Total		Chi-square (P-value)
Rood Corridor	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	**Freq.**	**%**	
Adum-Tanoso	10	66.67	5	33.33	0	0	0	0	**15**	**100**	14.87(0.32)
Adum-Pankronu	20	51.28	11	28.21	8	20.51	0	0	**39**	**100**	
Adum-Oduom	23	52.27	14	31.82	6	13.64	1	2.27	**44**	**100**	
Adum-Kronum	5	50	3	30	1	10	1	10	**10**	**100**	
Adum-Kokoben	6	42.86	8	57.14	0	0	0	0	**14**	**100**	
Total	**64**		**41**		**15**		**2**		**122**	**100**	

The majority of the respondents were below the age of 30 years. Since this points to a predominantly youthful population, it implies that decisions on the accessibility of side-walks, street crossings and other pedestrian infrastructure will have far-reaching consequences for the future (Table 4). Accordingly, policy decisions on transportation should purposefully factor in the needs of PWDs. The age of the respondents is not statistically associated with road corridors (p-value =0.38).

Table 4: Age of Participants

Road Corridor	Below 30 years		30-60 years		Total		Chi-square(p-value)
	Freq.	%	Freq.	%	Freq.	%	
Adum-Tanoso	3	4.23	6	11.76	9	100	4.19(0.38)
Adum-Pankronu	24	33.8	11	21.58	35	100	
Adum-Oduom	23	32.39	17	33.33	40	100	
Adum-Kronum	16	22.54	14	27.45	30	100	
Adum-Kokoben	5	7.04	3	5.88	8	100	
Total	**71**	**100**	**51**	**100**	**122**	**100**	

Experiences of PWDs

The PWDs shared their experiences regarding ease of movement along the side-walks and street crossing; the ease of locating street crossing; and the safety of crossing the streets. None of the respondents said it was easy going along (Table 5). Almost 90% of respondents said the movement was not easy.

Table 5: Experiences of PWDs

Responses	Yes		No		Sometimes		Total		Chi-square (p-value)
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Locating crossing	68	55.74	0	0	54	44.26	122	100	220.92(<0.01)
Safe crossing	14	11.48	81	66.39	27	22.13	122	100	
Easy movement	0	0	108	88.52	14	11.48	122	100	

The reasons included obstructions along the way caused by items of vendors and open sections of drains or wrongly placed signage. This was corroborated by the use

of the checklist. For example, Figure 4 indicates tables of bread sellers and signage blocking the side-walk along the route from Adum to Tanoso. Regarding the location of crossings, most of the respondents either indicated that they could locate them (55.74%) or could locate them at times (44.26%). It was observed that the experiences of the respondents were statistically associated with locating crossing, safe crossing and easy movement (p-value <0.01). This implies that these pedestrian challenges are real and likely to occur again.

Figure 4: Barriers on the side-walk
Source: Field data, 2023

Regarding safety, about two-thirds (66.39%) of the respondents felt unsafe crossing the roads. One interviewee noted, '*If I am not careful the drivers might hit me.*' This confirms the assertion of Ni et al. (2017) that pedestrians were the most vulnerable users at signalized intersections. Pecchini & Giuliani (2015) confirm the apprehension and nervousness experienced by PWDs when attempting to cross the road but this tends to be neglected in addressing accessibility concerns of PWDs.

Inclusiveness of pedestrian infrastructure

Side-walks

The surfaces of the side-walks were mostly firm and of non-slip materials as required except in instances where they were covered by sand and stones. However much of the Adum-Pankronu road did not have proper side-walks. This compelled pedestrians to use the road corridors. This poses a great danger to users, especially PWDs who may not have the ability to quickly jump out of the way of vehicles. Again, some drivers had parked vehicles on the road shoulders thereby forcing users (pedestrians) onto the road corridors hence exposing them to the potential danger of being hit by on-coming vehicles. Some of the side-walks did not have kerb ramps to allow PWDs to transition smoothly from the road crossing to the side-walk and vice versa. Although side-walks had been provided along some of the roads as required, there were also maintenance challenges as shown in Figure 5.

Figure 5: Maintenance challenges with side-walk at Suame
Source: Field data, 2023

Street crossings

According to Ojo et al. (2019), zebra crossings are the most dominant type of road crossing in Ghana and PWDs are familiar with them. Zebra crossings and other indicators of crossings were indeed seen along parts of the selected roads. The challenge was that some of the markings had faded. This calls for prompt maintenance. Table 6 provides information on zebra crossings along the roads. Kerb ramps were also not seen along the roads at the points of crossing and the side-walks. This is contrary to the requirements of the accessibility standards (Figures 6 and 7). No cane detectable kerb ramps were also identified along the roads studied (Figure 8).

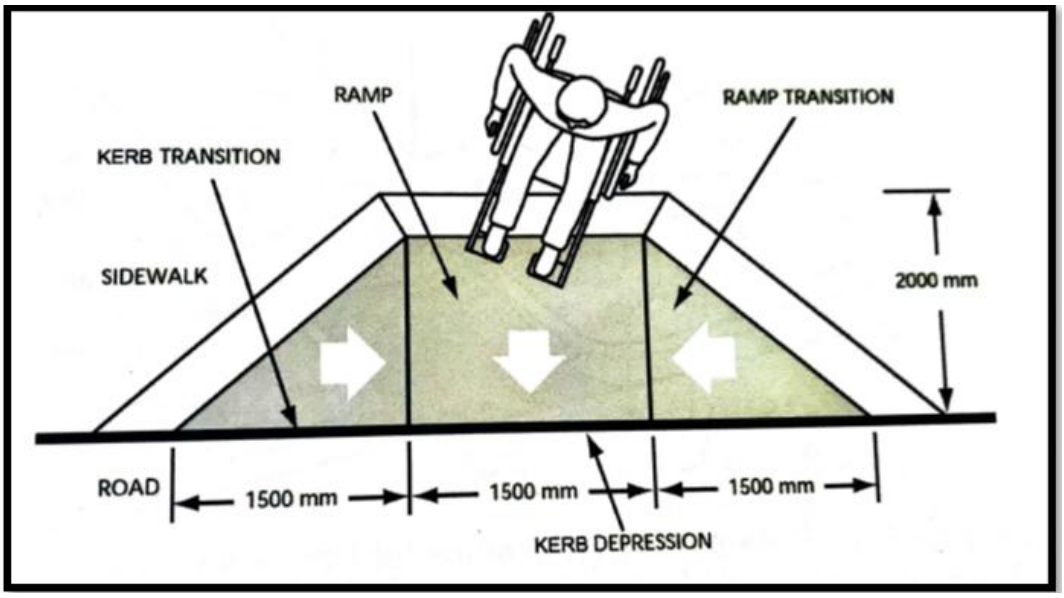

Figure 6: Kerb ramps

Source: GS1119: 2016

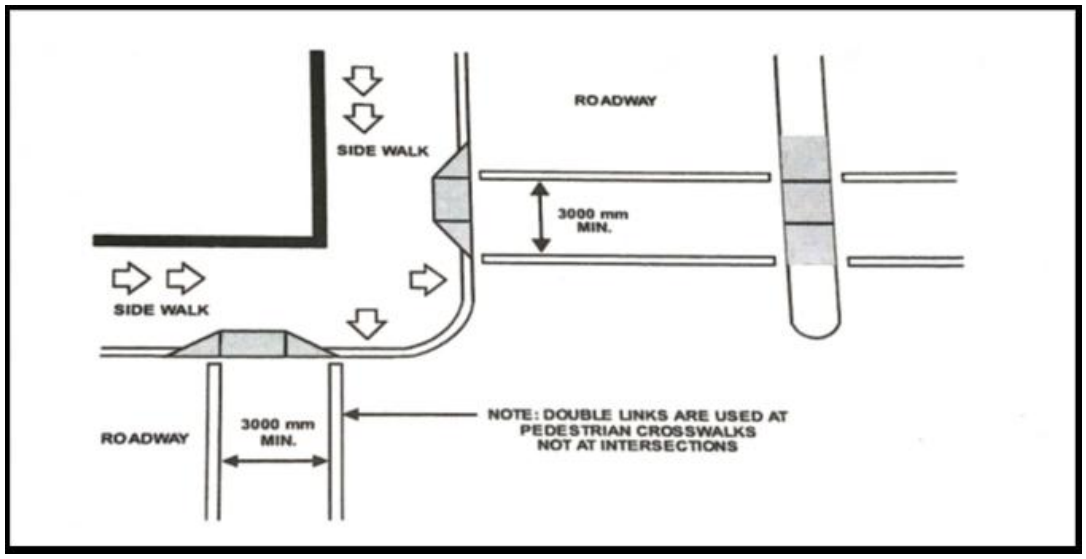

Figure 7: Kerb ramp at side-walk
Source: GS1119: 2016

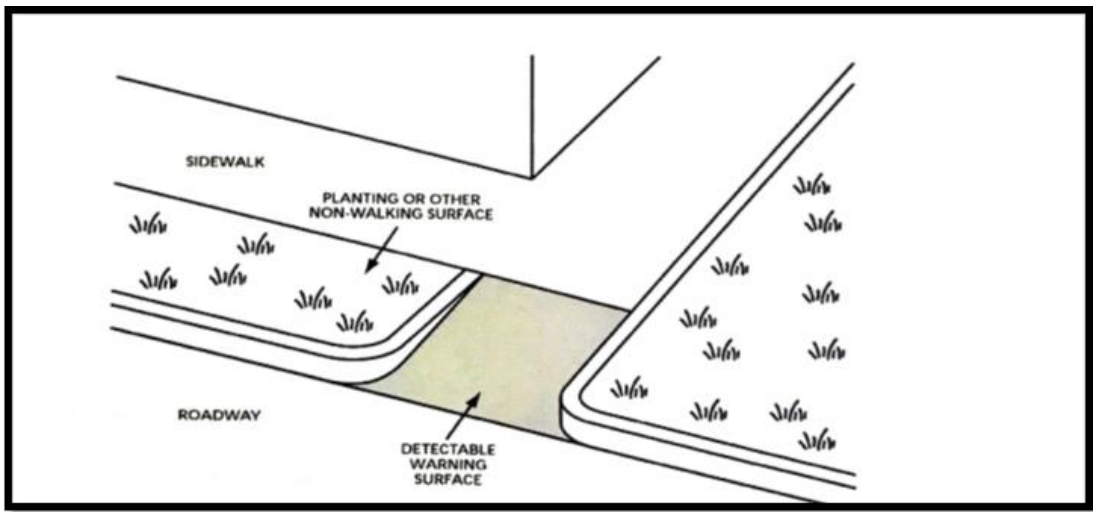

Figure 8: Cane detectable kerb ramp
Source: GS1119: 2016

Table 6: Zebra Crossings

Road Designation	Location of Zebra Crossing	Condition (V-Visible; F-Faded Paint)	Road Designation	Location of Zebra Crossing	Condition (V-Visible; F-Faded Paint)
Adum-Kronom	New Kejetia Dubai (5)	V	**Adum-Oduom**	Oduom Traffic light	V
Adum-Pankronu	New Kejetia	V		St Louis SHS	V

	Dubai (5)				
	Kumasi Wesley Girls	F		Mizpah School	V
	New Road Junction	V		Total Filling Station	V
	A/G Gospel Centre	V		Goil Filling Station	V
	Methodist Church Old Tafo	V		Shell Filling Station	V
	Multi Clinic	V		Hall 6	V
	Bosome Freho Rural Bank	V		Community Centre	V
	4 Miles Shell	V		Afful Nkwanta	V
	OKESS	V		Asafo SSNIT	V
	Tafo Melcolm	V		Asafo Market	V
	St Joseph Catholic Church, Pankronu	V	**Adum-Kokoben**	Maternal and Child Health Hospital	V
Adum-Tanoso	Maternal and Child Health Hospital	V		KATH	F
	KATH	F		4BN	F
	4BN	F		Palmer International School Junction	F
	UEW Crossing	F		Active Dental Clinic	F
				Tasty Queen/Star	F
				OWASS Basic	F
				OWASS	F
				Kokoben	F

Along the 8 km stretch of road from Adum to Tanoso, there were four zebra crossings with 75% being quite faded. A crossing (not zebra) that was seen near AAMUSTED, along that stretch, with appropriate signage had been overgrown with weeds and also lacked kerb ramps (Figure 9). Pedestrians had resorted to using another part of the road which they considered more appropriate as a crossing (Figure 10).

Figure 9: Lack of kerb ramp at crossing at AAMUSTED
Source: Field data, 2023

Figure 10: Alternative crossing at AAMUSTED
Source: Field data, 2023

The next was Adum-Kronom Road which had all its five road crossings within the CBD i.e. along the first kilometer of the road. It was again evident that although zebra crossings at these sections of the road were very visible, huge concrete blocks had been used by contractors working along the road to partially block the zebra crossings. Furthermore, there were barriers of kerbs and steps at the end of the crossing (Figures 11a and 11b).

Figure 11a: Zebra crossing with barriers
Source: Field data, 2023

Figure 11b: Zebra crossing with barriers
Source: Field data, 2023

The Adum-Kokoben road also had nine zebra crossings. The very visible one was within the CBD near the Maternal and Child Health Hospital. For the others, aside from being faded, there were barriers of kerbs as one transitioned onto the road island. The kerb at the OWASS Basic School crossing for instance was 26cm high. It is important to note that, there were no visible crossings along the Adum-Kokoben road from the Santasi roundabout section of the dual carriage to Kokoben where it finally became a single carriage. Even though the area around the Komfo Anokye Teaching Hospital (KATH) happens to be very busy with both pedestrian and vehicular traffic, there was no visible zebra crossing along that stretch of the road.

The Adum-Oduom road came next with 11 visible zebra crossings. In some instances, there were barriers of kerbs as one tried to transition from the zebra crossing to the road island. At Afful Nkwanta, the access from the zebra crossing was of steps which effectively served as a barrier to PWDs with ambulant challenges and the cane users. There were also instances where provisions that had been made on the road islands for pedestrians including PWDs to be able to pass and cross a lane on the other side had barriers of bollards (Figure 12). It is suspected that this was done to prevent motorists from using them as access ways or shortcuts. This defeats the purpose since it restraints the actual users. Road islands are of great value to pedestrians since they improve safety perceptions and must be appropriately handled (Ni et al., 2017).

Figure 12: Bollards hampering movement across the road island at the Kentenkrono crossing
Source: Field data, 2023

The Adum-Pankronu road topped with 15 zebra crossings. Paradoxically it was the road that lacked traffic lights. Again, for inexplicable reasons, only one was found at the Pankronu stretch of the road but there were nine at the Tafo stretch and the rest in the CBD part.

Though crossings had been provided at some points within the area studied, some had barriers of kerbs that hampered a smooth transition from the road to the pavement since there were no kerb ramps. For others, the challenge was at only one side of the road crossing while others had both sides affected (Figure 14). Indeed, attention needs to be given to these level crossings because they are preferred to overpasses and underpasses by pedestrians (Rankavat & Tiwari, 2016). The findings confirm Obeng-Atuah et al. (2017) that accessibility of crosswalks was a challenge to PWDs.

Signage
Signage is important for PWDs (GS 1119:2016, Section 2.2.5.1). It is supposed to be legible and readable from a distance, at an appropriate height and carry relevant information to the target group which along the roads would be the road users: drivers, commuters, and pedestrians (Figure 13). There was no disability signage along any of the roads that targeted PWDs.

Figure 13: Directional sign at the children's park
Source: Field data, 2023

The predominant signages seen had to do with speed limit, pedestrian crossing, speed humps, directional signs, names of suburbs and load height. Some of the signage also required maintenance attention. At a point near OWASS Basic School, the signage was down and had not been fixed (Figure 14). The crossing marks were also virtually faded (Figure 9).

Figure 14: Signage requiring maintenance attention
Source: Field data, 2023

Drains

Drains along the roads are expected to be covered to provide the required safety conditions, especially for users of the cane and those with ambulant disabilities. However, it was observed that there were open drains along some of the roads like the parts of the Tafo stretch of the Adum-Pankronu road and the Suame stretch of the Adum-Kronom road. There were also instances where portions of the drains were not covered (Figure 15). It was also noticed that in some instances, some slabs appeared to have been removed for maintenance works to be carried out but were not placed back after the exercise (Figure 16).

Figure 15: Partly covered drain at Suame
Source: Field data, 2023

Figure 16: Uncovered drain and street lighting along the Adum-Tanoso road
Source*:* Field data, 2023

This poses a danger to users like PWDs on such parts of the roads and is a serious violation of the requirements of the Accessibility Standards. Indeed GS 1119:2016 (Section 2.1.12) stipulates that all drains ought to be covered.

Footbridges and underpasses

Footbridges and underpasses were not a regular feature of the road architecture in the study area. According to Cantillo et al. (2015), they ought to be accessible when available. There was one footbridge at the Kwame Nkrumah University of Science and Technology's junction (KNUST junction) along the Adum-Oduom road (Figure 17). It had gentle sloping ramps which conformed to the Accessibility Standards. The surfaces were of non-slip material with adequate protection at the sides. The main access challenge was the presence of traders who had blocked the entrance with their wares.

Figure 17: Footbridge at KNUST Junction
Source: Field data, 2023

The only underpass was also located at Sofoline along the Adum-Tanoso road. It appeared not to be patronized, confirming the assertion of Rankavat & Tiwari (2016) who claimed that pedestrians prefer the zebra crossings at such locations.

Traffic lights

Traffic lights are generally positioned at pedestrian crossings and traffic intersections to control the flow of traffic and also to ensure the safety of pedestrians who try to cross the roads. Aside from the lights which generally direct the movements of the vehicles, the traffic lights are to have push buttons for use by PWDs for their safety. The study along the arterial roads revealed that the Adum-Pankoronu road did not have a single traffic light. Furthermore, none of the traffic lights had provision for pedestrian controls on them. One found near the Military Museum in Adum was not functioning at the time of the study (Figure 18).

Figure 18: Poorly maintained traffic light
Source: Field data, 2023

The lack of adequate traffic lights was also evident along the Adum-Pankronu road. Of the cumulative road network of 40 km of arterial roads surveyed in the study, there were a total of 25 spots with traffic lights. This is woefully inadequate. Of the 25, none had a device for pedestrian control making it more difficult for PWDs to use. The 25 were also not evenly spread. As can be seen from Table 7 majority (40%) were along the Adum-Oduom road, probably because it is the road that leads to the national capital. The least (4%) could be found along the Adum-Pankronu road. Out of the 25, only 44% were functioning at the time of the study. The majority of the functioning traffic lights were along the Adum-Oduom road (63.64%) while Adum-Tanoso followed with less than half (27.27%). This means that over 90% of functioning traffic lights within the study area are just along two out of the five routes. There were no traffic lights along the whole stretch from the Santasi roundabout to Kokoben although there were key spots along the stretch where the road design allowed for vehicles travelling along one lane to turn onto or across the other lane. Given the fact that this is a major highway, these pose risks not only to PWDs but other road users and pedestrians who may ultimately become PWDs or lose their lives as a result of the state of the road. This underscores the perspectives of Alfred & Woodcock (2008) who noted that the car economy was a major cause of impairment hence the need for appropriate attention. Persons who are blind or have a low vision may also need assurance that they are crossing at the right time and in the right direction. These make the provision, timing and control of traffic lights as well as the provision of audible and visual clues very essential (GS 1119:2016 Section 2.5.5).

Table 7: Traffic Lights

Road Designation	Traffic light location	Condition (F-Functioning; NF-Not Functioning)	Proportion of the total provided		Proportion of functioning lights	
			Freq.	%	Freq.	%
Adum-Kokoben	Military Museum	NF	2	8.00	1	9.09
	Victoria Opoku Ware Road	F				
Adum-Kronom	Melcom (Adum)	NF	3	12.00	0	0.00
	New Road Junction (Suame)	NF				
	Bremann Junction	NF				
Adum-Pankronu	Melcom (Adum)	NF	1	4.00	0	0.00
Adum-Oduom	KMA	NF	10	40.00	7	63.64
	STC/A.Life	NF				
	Amakom	F				
	Children's park	F				
	Anloga Junction	F				
	Poku Transport	NF				
	Top High	F				
	KNUST Police Station	F				
	Boadi Junction	F				
	Oduom	F				
Adum-Tanoso	Military Museum	NF	9	36.00	3	27.27
	Victoria Opoku Ware Road	F				
	Sofoline	NF				
	SDA Hospital (Kwadaso)	F				
	Asuoyeboah	F				
	SSNIT flats	NF				
	IPT Junction	NF				
	AAMUSTED	NF				
	Presbyterian Church (Tanoso)	NF				
Total			**25**	**100.00**	**11**	**100.00**

A general problem was the lack of controls for PWDs and other pedestrians like the aged and pregnant women to regulate the speed of the traffic lights as required by GS 1119:2016 (Figures 18, 19 and 20). They need more time to make a safe crossing.

Figure 19: Traffic light at Victoria Opoku Ware junction
Source: Field data, 2023

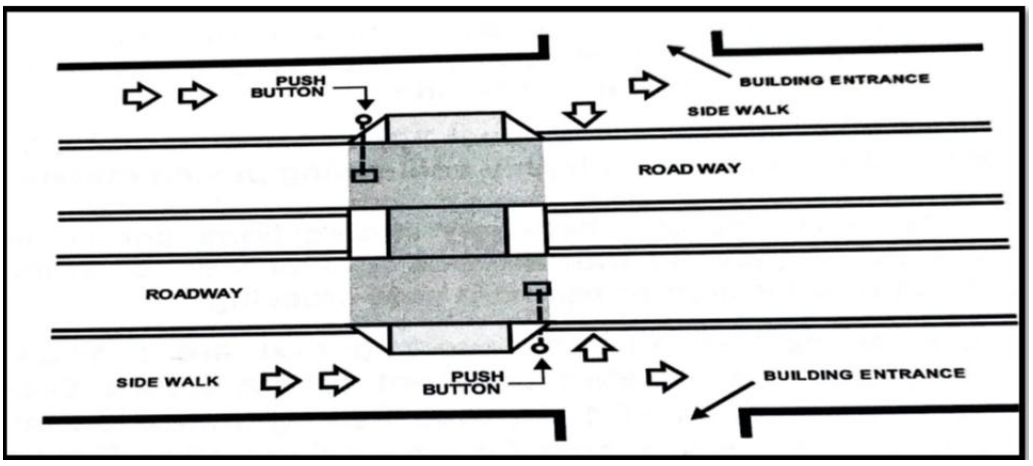

Figure 20: Pedestrian push buttons
Source: GS1119: 2016
The traffic lights did not pass the test of being both audible and flushing as indicated in the Standards.

Bus rest stops
Along the roads, there is the need for the provision of convenient places where road users like PWDs can rest while waiting for public transport or just as a place to rest and continue their journeys along the pedestrian side-walks. These were predominantly lacking along the roads that were studied. Although the designs of the roads made provision for parking/stopping spaces for passengers to alight or board vehicles, only a few bus rest stop structures were provided along the roads for pedestrians as rest places. These were along the Adum-Kokoben road and the Adum-Oduom road. Unfortunately, the only one along the Adum-Kokoben road located near Opoku Ware School was in a state of disrepair (Figure 21). This also strongly brings out the fact that decisions on the provision of facilities should not be made in

isolation. They should be tied to how maintenance management can ensure the sustainable use of such facilities. Along the Adum-Oduom road, there were bus rest stops in places like Kentinkrono, Oforikrom and Amakom but were poorly maintained.-Additionally, the Oforikrom bus rest stop was located on the side-walk, which impeded passage by pedestrians.

Figure 21: Poorly maintained rest stop at Opoku Ware School
Source: Field data, 2023

The remaining bus rest stops were sited along the Adum – KNUST and Adum - Kokoben roads. There were two types of bus rest stops along these roads. There were the old ones which were in a poor state of disrepair like the ones along the Adum-Kokoben road and the new ones most of which were located along the Adum – KNUST road at the Children's Park and the Amakom Traffic Light areas (Figures 22 and 23). A critical assessment of the design of the new ones showed ample evidence that PWDs, especially those with ambulant challenges, were not considered in the design. Kerbs and steps have to be surmounted before one can gain access to these bus rest stops.

Figure 22: New rest stop at Amakom traffic light but without a ramp
Source: Field data, 2023

Figure 23: New rest stops at Amakom children's park with steps
Source: Field data, 2023

It was also observed that there were ongoing construction activities to provide such facilities at other locations like KNUST Junction and Hall Six along the Adum-Oduom road. The designs had steps at the entrance to these bus rest stops which impeded access for PWDs (Figure 24). This confirms Tudzi et al. (2017) that the needs of PWDs are usually considered as an afterthought in such construction activities. Per the Accessibility Standards, bus stops or bus transit shelters should be located on a firm-level base and be at the same elevation as the side-walk/walkway (GS 1119:2016, Section 2.2.2 and 2.2.3).

Figure 24: A rest stop under construction at KNUST Junction with steps
Source: Field data, 2023

CONCLUSION AND RECOMMENDATIONS

PWDs think that the pedestrian infrastructure is not inclusive. The lack of kerb ramps, side-walks with barriers, lack of provision for PWDs to manipulate traffic lights, barriers on street islands, and poor maintenance of pedestrian infrastructure that adversely affect PWDs as observed along the Kumasi arterial roads, attest to a lack of enforcement of laws, standards, and policies. In effect, not much has changed since the Accessibility Standards of Ghana (GS 1119:2016) came into force. It further buttresses the need for enforcing codes necessary for the actualization of the rights of PWDs regarding accessibility. These also point to the fact that some designers and contractors may not very well appreciate issues about the travel path requirements of PWDs along side-walks, street crossings, and other pedestrian infrastructure. Finally, the study raises the very critical issue of not just being fixated on the provision of accessible facilities in the first instance, but also the need for conscious and consistent monitoring so that whenever there are maintenance challenges, they can be addressed to enable PWDs to continuously use safe, comfortable and covenant side-walks, street crossings and other pedestrian infrastructure. Policies to guarantee the human rights of PWDs in consonance with the provisions of the CRPD and the 2030 Agenda for Sustainable Development should aim at not only enforcing the provisions of the various legislation on accessibility for PWDs but should also look beyond the point of provision to the operational issues with emphasis on maintenance. Further studies are recommended to ascertain why some designers, contractors and managers of road infrastructure fail to wholly apply the provisions of various legislation and standards that aim at ensuring accessibility for PWDs. This study can also be scaled upwards to present the picture as it pertains to other parts of the county and beyond.

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Appendix I: Articles on Kumasi

S/N	Year	Author(s)	Journal	Title	Pages
1	2022	Joseph Ocran	Cogent Social Sciences	"There is something like a barrier": Disability stigma, structural discrimination and middle-class persons with disability in Ghana	1 to 17
2	2022	Abena A. Obiri-Yeboah, Prince Owusu-Ansah, A.R. Abdul-Aziz, Saviour Kwame Woangbah ,Jack Nti Asamoah	Results in Engineering	Modelling the economic impact of rickshaw transportation in Ghana: The case of kumasi	1 to 11
3	2022	Ransford A. Acheampong and Stephen Boahen Asabere	Journal of Transport Geography	Urban expansion and differential accessibility by car and public transport in the Greater Kumasi city-region, Ghana—A geospatial modelling approach	1 to 15
4	2022	Akoto, Y., Nketsia, W., Opoku, M. P., Fordjour, M. O., & Opoku, E. K.	Education policy analysis archives	Applying a Socio-Ecological Model to Understand the Psychosocial Support Services Available to Students with Disabilities in Universities	1 to 25
5	2022	Doris Boateng, Charles Quansah, Ronald Osei Mensah, Agyemang Frimpong, Evelyn Nana Ama Asare	ResearchGate	Assessing the Impact of Transportation on the Economic Development in the Kumasi Metropolis	117-148

6	2021	Dorcas Asenyeni Anabire	International Journal Of Research Culture Society	Gender Inequalities in the Use of Technologies of Mobility in Accra and Kumasi, Ghana-West Africa. The Case of the Motorcycle.	51-56
7	2020	Abena A. Obiri-Yeboah, Adwoa S. Amoah, Maud S. Gbeckor-Kove	International Journal for Traffic and Transport Engineering	Analysis Of Congestion On Some Road Link Sections Using Roadside Friction In Congestion Index In Kumasi	31-40
8	2020	Patrick Brandful Cobbinah, Eric Gaisie, Nana Yaw Oppong-Yeboah, Desmond Ofosu Anim	Cities	Kumasi: Towards a sustainable and resilient cityscape	1 to 16
9	2019	Vivian Yeboah, Michael Osei Asibey	Case Studies on Transport Policy	Transport and historical changes in Kumasi's growth and form	802–813
10	2019	A.K. Danso, B.T. Atuahene, &.K. Agyekum	ANNALS of Faculty Engineering Hunedoara – International Journal of Engineering	Accessibility Of Built Infrastructure Facilities For Persons With Disabilities	185-192
11	2018	Justice Kufour Owusu-Ansah, Annie Baisie & Eric Oduro-Ofori	GeoJournal	The mobility impaired and the built environment in Kumasi: structural obstacles and individual experiences	1003–1020

12	2017	Gabriel Klaeger	The Making of the African Road	The Making of the African Road: Africa-Europe Group for Interdisciplinary Studies, Volume: 18	
13	2017	Patrick Brandful Cobbinah, Honorata Nsomah Aboagye	Land Use Policy	A Ghanaian twist to urban sprawl	231–241
14	2017	Danso, A.K., Tudzi, E.P., Hammond, S. and Agyekum, K.	Journal of Science and Technology	Accessibility of the Central Business District of Kumasi: Perceptions of Persons with Disabilities	80-93