ASSESSING THE ACCESSIBILITY OF BUILT INFRASTRUCTURE FACILITIES FOR PERSONS WITH DISABILITIES: A CASE OF THE SOFOLINE INTERCHANGE

[1]Danso, A.K., [2]Atuahene, B.T. and [3]Agyekum, K.

[123]Kwame Nkrumah University of Science and Technology, Kumasi, Ghana
akdansoh2000@yahoo.com, btatuahene@gmail.com and agyekum.kofi1@gmail.com

Abstract

Currently, disabled people face different kinds of discriminations, posing difficulties and disadvantages of different sizes. Key amongst such challenges is the ability to access built infrastructure like roads. A challenge is posed to planners and design professionals as to how they are able to improve accessibility of the built environment, specifically the transportation infrastructure system to help reduce the suffering of Persons with Disability (PWDs) in Ghana. This research was conducted to examine the accessibility of the Sofoline Interchange to PWDs. It employed open-ended questionnaires and a checklist that sought the views of respondents (the project consultant, the contractor and the client / Ministry of Roads and Highways in Kumasi Metropolitan Assembly) working on the Sofoline Interchange on key issues pertaining to PWDs. Findings showed that facilities needed by the visually impaired such as audio communications, handrails, tactile markings and curbs have not been incorporated into the design of the Sofoline Interchange, making it unfriendly to the visually impaired. The findings from this study should enable all stakeholders concerned to come together to find ways to address this issue, especially when it comes to the construction of such facilities to enable the PWDs to access them freely.

Keywords: Disability, Interchange, Kumasi, Accessibility.

Introduction

In 2002, it was estimated that 15 million people in the United States faced difficulties in getting access to the transportation system they needed. Of these, about 6 million (40 percent) were people with disabilities. Also, out of the 3.5 million people who never leave their homes, about 1.9 million of them are people with disabilities. This implies that more than half a million people with disabilities never leave their homes because of transportation difficulties (U.S. Department of Transport, 2003). Succintly, disability is a universal challenge and its associated impediment is universally experienced. This notion might have caused Katzmann (2010) to chide government on not providing accessible transportation infrastructure to its disabled populace. Axelsson and Barrett (2009) indicated that a good transport system must provide for both mobility and accessibility to ensure both safety and efficiency in its usage. In addition, Scottish Executive Social Research (2006) avowed that, the quality of the pedestrian environment matters most in facilitating disabled people to equally access the public transport network, since many obstacles might be encountered in the street environment (Eck, 2004).

Currently, disabled people face different kinds of discriminations, posing difficulties and disadvantages of different sizes. In the past, barriers such as bad designs, insufficient knowledge or discriminatory behaviours caused the exclusions of disabled people from social life. The restraints that the disabled

people face generally require psychological and sociological analyses. Limitations in accessibility to public spaces and transportation systems stand out as the most solid physical exclusions. For many people with disabilities, life is severely limited by barriers in the transportation environment. Some people with disabilities who are willing and able to work cannot do so because of inadequate accessible transportation (Baris and Uslu, 2009). Others cannot shop, socialize, enjoy recreational or spiritual activities, or even leave their homes for the same reason. Some individuals with disabilities must live in institutions solely because of constraints in the transportation environment which will enable them attend to medical appointments (Baris and Uslu, 2009). Kirschbaum et al. (2001) enunciated that transportation policies forget pedestians but are mostly focused on the needs of motorists. These systems can however be be improved for pedestrians (of whom the disabled are part) by integrating accessibility and involving the pedestrians in the project planning process. Of late, road interchanges have become the hub for the development of many road networks.

Davies and Jokiniemi (2008) defined Interchange as a major road junction in which traffic can flow freely from one road or motorway to another without stopping or slowing down; most often a grade-separated junction with a number of ramps leading from one carriageway to another. The introduction of these facilities have helped to reduce the effect of traffic pressures on roads, making transportation quite comfortable, time effective and less costly (Wolshon, 2004). Moreover, interchanges are designed to be unforgiving such that, the designed speed does not allow other road users such as pedestrians to make use of it, without going through difficulties (Dumbaugh and Wenhao, 2011). Pedestrians who make use of road interchanges fall into several categories (Eck, 2004). For the purposes of this study, the pedestrians are classified as abled, disabled and special needs (Eck, 2004). The abled are the people with no impairments in their wellbeing, the disabled are the people with impairments in their wellbeing and the special needs include, the aged, a woman carrying a baby, someone carrying a luggage, or one pulling delivering dollies (SOLIDERE, 2003-04). As far as, the built environment is concerned, it should be barrier free and equally accessible to anyone without difficulties, which regrettably most are not.

The "PERSONS WITH DISABILITY ACT, 2006" also known as ACT 715 was passed a decade ago to be the mouthpiece for the disabled in the society (Ghana). This Act ensures that public and private buildings including roads are easily accessible, enabling persons with disabilities (PWDs) their freedom of association, free movement, right to education and choice of religion. Now international bodies have laid down guidelines and the disability Act of Ghana has also made provisions for the design and construction of easy, accessible and disability friendly infrastructure. A preliminary survey conducted by Danso (2011) on monumental buildings in Ghana revealed that, those buildings need urgent attention to make them disability friendly. Ironically, the Parliament House of Ghana where the ACT 715 was passed also failed to provide easy accessibility to the disabled. Axelsson and Barrett (2009) commented that, an accessible environment can be a space or set of services that can be of immense use by all, without any stumbling blocks, which permit unrestricted and harmless movement, function and access for all, irrespective of age, sex or situation. This concept can also be explained as making things readily available to all people, whether they are disabled or not.

Ghana has experienced considerable infrastructural development for the past 20 years, moving from the normal road networking system to the introduction of interchanges. Currently, Ghana can boast of several interchanges such as the Ako-Adjei Interchange (AAI), the famous Tetteh- Quarshie Interchange (TQI), the Tetteh Quarshie-Mallam interchange (George Walker Bush Highway), the Asafo Interchange and the newly constructed Asokwa Interchange. All these structures have

been nicely constructed with great architectural and structural features which have contributed to the infrastructure advancement of the country. However, they all amount to nothing because they do not only neglect the disabled, but compound their accessibility also. The much criticized George Walker Bush Highway noted for accidents involving pedestrians, draws down to the point that, some relevant consideration during its design and even its construction was sadly overlooked. With the abled people having difficulties in accessing such routes, the disabled will be nothing to write home about. With this sad experience, the on-going Sofoline Interchange Project, which intends to ease the vehicular traffic situation in and around the City of Kumasi, though, still under construction, should not be finished with all these mistakes repeated. This study was therefore undertaken to assess the Sofoline Interchange and ascertain its accessibility to PWDs

Literature Review

An interchange is where there is a vertical separation with its unique features of ramps which connect the intersecting roadways (Palmer Engineering, 2004). Wolshon (2004) asserted that, freeway interchange is primarily a function of the directional demand between the various intersecting freeways and roadways as well as other cost and right-of-way limitations. The objectives of freeway interchanges are to maximize the operational efficiency and safety aspects within the interchange vicinity. Dumbaugh and Wenhao (2011) suggested that, freeways are high-speed, limited access facilities that are typically designed to be forgiving to random driver error. Pedestrians and cyclists are legally excluded from using these facilities, and access is strictly controlled through the use of grade-separated interchanges. Equal access is to safeguard individuals to make effective, efficient use, delight in and partake of the built environment, facilities, programs, services, employment opportunities and technology with easy movement and circulation. It also means offering all users of a facility the same provisions for priority, security and safety. It has become an international headache, because; some minorities of people who are inhabitant of the society are being shelved during decision making concerning the design of the society (Whole Building Design Guide, 2012). Equal access expounds on breaking barriers of discrimination and protecting human rights.

The Canadian Standard Association, CSA, (1995) defined accessibility as "a program, activity, meeting, hearing, or other event or process that is readily usable by an individual, regardless of his or her abilities. When used in reference to a building or facility, it means that a facility can be approached, entered and used by any individual, regardless of his or her abilities". In relation to disability, accessibility is defined as the absence of barriers which prevents a person with any form of disability from fully participating in all aspects of society because of their disability. A society that believes in equity should be instrumental in providing accessible environment for its citizens with freedom and the means to pursue an active social and economic life. Where there is a setting in which the citizens have free access to buildings, premises and other facilities without the help of others, it can be said that an individual has enjoyed his /her rights as a citizen: an accessible environment means that a person will be able to seek employment, receive education and training, and pursue an active social and economic life (European Commission, 2010(2003)).

To have an equal access, designers of the environment should consider different requirements that can be of the highest level of flexibility (Baris and Uslu, 2009). Kirschbaum *et al.* (2001) pronounced that more often accessibility is thought of as a separete issue to be addressed after the planning and development process of a project is complete. Katzmann (2010) added that, the confortability and accessibility of citizens have been traded for cost-effectiveness of infrastructure systems. Imrie (2004) accentuates that a person's mental and physical well-being is related to many circumstances, not the least of which is the

quality of their dwelling and home environment. An important part of such quality is physical design and layout, and how far it enables the ease of people's mobility and movement around the dwelling and the use of different rooms and their facilities.

Disability

As of 2008, about 10% of the world's population (650 million of which 200 million were children) were disabled, and this represented the world's largest minority (Department of Economic and Social Affairs, United Nations, 2012). This is an indication that, the world will be counting billions of people with disability because disability increases through population growth. World Report on Disability 2011 confirms that, about a billion people are living with different forms of disability (World Health Organization, 2011). Disability is a form of impairment that has lived with mankind from the past, and will continually be part of the society. Numerous people with disabilities do not have equal access to health care, education and employment opportunities. Disability-related services are not available to them, excluding them from everyday life activities.

Disability is part of human condition. According to Disability Discrimination Act 1995 (Her Majesty's Government, 1995), "a person has a disability for the purposes of this Act if he has a physical or mental impairment which has a substantial and long-term adverse effect on his ability to carry out normal day-to-day activities." WHO also defines disability "as any restriction or lack (resulting from impairment) of ability to accomplish an activity in the manner or within the range considered common for a human being".

Meyers *et al.* (2002) emphasized that disability has been regarded as a stagnant development, reflecting more or less persistent on functional impairments that were the consequences of illness and injury. Disability is thought to result from interactions between individuals and the environments, which in turn consist of complicated arrays of social, cultural, political, climatic, topographic, architectural, and technological components. Clarke *et al.* (2009) described disability as a substantial limitation in daily life activities and is commonly measured in terms of difficulty performing activities of daily living or more complex instrumental activities of daily living. Neufeldt and Mathieson (1995) from their article highlighted that; disability has been through a form of changes with respect to definition from 'deficit or loss to statistical deviance from norm'. However, environmental discrimination still remains a big challenge for the disable. These environmental discriminations are as a result of failing to take reasonable steps to remove barriers in the social environment that prevent disabled people from participating equally.

Road design and accessible environment

Davies and Jokiniemi (2008) defined built environment "as an urban or rural milieu, structured or produced by built form; that part of the surroundings relating to buildings, structures and civil engineering works". The "built environment" as defined comprises of urban design, land use, and the transportation System, which encompasses patterns of human activity within the physical environment (Handy et al., 2002). Built environment are being constructed for use by the inhabitants within a community. The Road Traffic Regulation Act 1984 states that a road means 'any highway or of any other road to which the public has access' (Denney, 2004; *Road Traffic Regulation Act, 1984).* Thus, a highway is a road as far as the law is concerned. However, highway becomes a road if it provides a means of mobility for the public over it. As far as the built-up environment including roads is concerned, it is imperative that it should be barrier-free and adaptable to fulfil the needs of all people equally.

The needs of the disabled coincide with the needs of the majority (SOLIDERE et al., 2003-04;

U.K. Department for Transportation, 2005). A group of people are to a disadvantage when the built environment is designed in a discriminating manner, especially, when the impairment is made up of people with special needs (Seeland and Nicole, 2006). A person's environment has a huge impact on the experience and extent of disability. Inaccessible environments create disability by creating barriers to participation and inclusion (World Health Organization, 2011).

Since the Second World War, road transport has been of immense contribution to the well-being of mankind. The scope of road transportation has developed very largely. The increasing population in the world has significantly led to the increase of vehicular traffic in private transport system, that is, road space available was becoming insufficient to meet the growing demand of traffic and congestion started. This led to the increased attention towards control of vehicles so that the road transport infrastructure would be optimally used. Various control measures like traffic signals, providing roundabouts and medians, limiting the speed of vehicle at specific zones were implemented. With the advancement of better roads and efficient control, more and more investments were made in the road sector, especially after the World Wars. These controls were to intervene, deliberately in the complex fabric of society to use transport effectively and to assure safety and security to people and vehicles (Wolshon, 2004; Abdulhai and Kattan, 2004). Axelson *et al*. (1999) defined pedestrians as people who travel on foot or use assistive devices, such as wheelchairs for mobility as a mode of travel. Environment free of barriers is also of great benefit to the abled because one characteristic of a pedestrian is to use the least energy route between two points (Eck, 2004). However, Axelson et al. (1999) emphasized earlier that, in reality, the travel speeds, endurance limits, physical strength, stature and judgemental abilities of pedestrians vary tremendously. People with disability are more likely to be pedestrians since some physical limitations can make driving difficult. Meanwhile, most at times, pedestrian features incorporated in road designs are an afterthought which result in treacherous barriers to walking (Eck, 2004). Social exclusion has become increasingly prominent in the world, which occurs as a result of a series of problems that prevent people from being able to participate in activities that are considered normal in their society. Some of these problems are related to issues of accessibility (Frye, 2013; Titheridge et al.,2009). Slinn *et al.* (2005) pointed out that with urban areas, the physical constraints are more related to the built environment. Particular challenges to the design of the urban environment have materialized from community safety, accessibility and social inclusion, raising a wide range of issues affecting mobility and participation in everyday life. Accessibility in this context relates to the ability to reach a range of social, leisure and employment destinations from home and therefore access to pedestrian and transport systems (Graeme, 2009).

Carrying packages or luggage, pulling delivery dollies or transporting items, a child, people with temporary accident injuries and an aged person are mobility impaired by different forms of environmental barriers in their daily lives. An individual can be temporary or permanently be disabled at some points in life with regards to certain parts of the body or under some life conditions like age, illness or injury; there are a minority of people who live all their lives healthy and without any disability related problems (Axelson *et al.*, 1999; SOLIDERE, 2003-04). Feng *et al*. (2010) iterated that equity fundamentally denotes fairness or justice of the distribution of impacts. Equity is important since inequities interrupt the logic of fairness of many individuals; people behave in ways consistent with their concern for fairness and caring about how they fare individually (Titheridge et al., 2009). In transportation, emphasizing the equity means that the public sector is required to provide equal opportunities to different groups of people to use transportation networks which is built in the community. Transportation practitioners are advised to avoid disproportionate adverse impacts

on minority and to mitigate such impacts when possible (Torres, 2008). In transportation network modelling, the influence in change of transportation services provided to various groups of people is as a result of equity demanded by the minority in the community (Feng et al., 2010).

Wolshon (2004) unequivocally suggested that, the highway design process necessitates the knowledge of most of the sub-disciplines of civil engineering but requires the understanding of many aspects of the basic sciences which includes psychology. According to Baris and Uslu (2009), restrictions in accessibility to public spaces and transportation sytems have obviously been seen as more concrete or physical exclusion. Moreover, challenges generally faced by the disabled require psychological and sociological analyses as there is an expansion on social and economic restraints. Among, the basic modules that prompt road design are its users which includes pedestrians. Osbourn and Greeno (2007) added that the fundamental requirement of designing the built environment should take into consideration the delight of the building which includes the psychological appeal of the built environment for its's users. Dempster (2008) is of the view that, planners should make it a priority to integrate awareness about environmental barriers leading to health impacts into the development and regulation of actions that affect the design, construction and re-construction of our built environments. Creating the awareness and changing practices tend to create healthier and safer communities in ways that are beneficial for all (Litman, 2008).

Disability situation in Kumasi (Ghana)

According to the 2010 Population Census report, about 737,743 representing 3% of Ghana's population are faced with one or other forms of disability: 2.9% of the male population are with disability whilst 3.1% of females are with disability (Table 1). Out of the 737,743 people with disability, about 47.5% are males and the remaining 52.5% are females. From the disability table, indications show that Ashanti region with Kumasi as its capital is the region with the greatest number of people with disability representing 124,501 (16.88%) out of the 737,743 (GSS, 2012).

Although, Ghana has not embarked on a national survey to determine specifically the disability rate in the country, the GSS (2012) has been able to estimate a number of people with disability in Ghana with the classification they fit from the 2010 Population and Housing Census. Earlier surveys of individual districts by the Ghana Human Development Scale (GHDS) in 1993 and the Norwegian Association of the Disabled (NAD) in 1998 and 1999 indicated that;

The three most prevalent types of disability are those with visual impairment, hearing and physical disabilities (Ghana Federation for the Disabled , 2008).

The current Census report GSS (2012) indicated that 1.2% out of the 3% population with disability is visually impaired, 0.8% is physically challenged, 0.4% have hearing impairments, and 0.6% have emotional disabilities. These somehow attest to earlier reports.

Ashanti region is adjudged the most populated region with 4,780,380 people representing 19.4 of the country's total population (GSS, 2012). The basic mode of transportation within the region is by Land, although the Land transportation includes Highways and Rails. The Rails sector is now defunct, making the Highway the recognised and appreciated mode of land transportation.

Table 1 Population by Sex. Disability status, type of disability and region.

Disability type	All Regions		Western	Central	Greater Accra	Volta	Eastern	Ashanti	Brong Ahafo	Northern	Upper East	Upper West
	Percent	Number										
Both Sexes	**100.0**	**24,658,823**	**2,376,021**	**2,201,863**	**4,010,054**	**2,118,252**	**2,633,154**	**4,780,380**	**2,310,983**	**2,479,461**	**1,046,545**	**702,110**
Population without disability	**97.0**	**23,921,080**	**2,310,005**	**2,125,924**	**3,906,115**	**2,026,485**	**2,538,575**	**4,655,879**	**2,256,945**	**2,418,167**	**1,006,621**	**676,364**
Population with disability	**3.0**	**737,743**	**66,016**	**75,939**	**103,939**	**91,767**	**94,579**	**124,501**	**54,038**	**61,294**	**39,924**	**25,746**
Visual/Sight	1.2	295,720	27,484	32,552	43,836	40,667	40,032	50,099	17,820	17,603	15,972	9,655
Hearing	0.4	110,625	8691	10702	10713	14335	15076	18065	9130	10838	8511	4564
Speech	0.4	101,096	9,037	9,819	13,743	12,390	14,368	17,580	8,948	7,529	4,958	2,724
Physical	0.8	187,522	16,654	21,746	24,215	24,396	27,791	32,283	14,987	11,308	8,725	5,417
Intellectual	0.5	112,082	9,794	9,900	17,509	15,379	14,738	17,959	8,634	9,747	5,134	3,288
Emotional/Behavioral	0.6	136,898	10,742	11,652	22,117	19,354	17,130	19,983	11,531	14,454	5,259	4,676
Other	0.3	76,692	6,126	6,247	11,682	7,001	7,487	12,448	4,955	13,443	3,241	4,062
Male	**100.0**	**12,024,845**	**1,187,774**	**1,050,112**	**1,938,225**	**1,019,398**	**1,290,539**	**2,316,052**	**1,145,271**	**1,229,887**	**506,405**	**341,182**
Population without disability	**97.1**	**11,674,749**	**1,155,133**	**1,015,696**	**1,889,121**	**978,097**	**1,246,505**	**2,257,940**	**1,118,344**	**1,198,702**	**486,825**	**328,386**
Population with disability	**2.9**	**350,096**	**32,641**	**34,416**	**49,104**	**41,301**	**44,034**	**58,112**	**26,927**	**31,185**	**19,580**	**12,796**
Visual/Sight	1.1	132,862	13,050	13,874	19,205	17,364	17,918	22,076	8,668	8,849	7,369	4,489
Hearing	0.4	50,125	4,228	4,569	5,052	6,237	6,780	7,935	4,231	5,312	3,737	2,044
Speech	0.5	54,859	5,101	5,195	7,503	6,492	7,685	9,548	4,898	4,152	2,754	1,531
Physical	0.7	87,872	8,072	9,565	11,613	10,840	12,713	15,106	7,190	5,685	4,396	2,692
Intellectual	0.5	55,306	4,946	4,784	8,702	7,002	7,230	8,892	4,412	4,888	2,676	1,774
Emotional/Behavioral	0.5	65,470	5,301	5,432	10,270	8,875	7,993	9,419	5,798	7,232	2,723	2,427
Other	0.3	37,323	3,121	2,871	5,826	3,262	3,616	5,778	2,444	6,739	1,620	2,046
Female	**100.0**	**12,633,978**	**1,188,247**	**1,151,751**	**2,071,829**	**1,098,854**	**1,342,615**	**2,464,328**	**1,165,712**	**1,249,574**	**540,140**	**360,928**
Population without disability	**96.9**	**12,246,331**	**1,154,872**	**1,110,228**	**2,016,994**	**1,048,388**	**1,292,070**	**2,397,939**	**1,138,601**	**1,219,465**	**519,796**	**347,978**
Population with disability	**3.1**	**387,647**	**33,375**	**41,523**	**54,835**	**50,466**	**50,545**	**66,389**	**27,111**	**30,109**	**20,344**	**12,950**
Visual/Sight	1.3	162,858	14,434	18,678	24,631	23,303	22,114	28,023	9,152	8,754	8,603	5,166
Hearing	0.5	60,500	4,463	6,133	5,661	8,098	8,296	10,130	4,899	5,526	4,774	2,520
Speech	0.4	46,237	3,936	4,624	6,240	5,898	6,683	8,032	4,050	3,377	2,204	1,193
Physical	0.8	99,650	8,582	12,181	12,602	13,556	15,078	17,177	7,797	5,623	4,329	2,725
Intellectual	0.4	56,776	4,848	5,116	8,807	8,377	7,508	9,067	4,222	4,859	2,458	1,514
Emotional/Behavioral	0.6	71,428	5,441	6,220	11,847	10,479	9,137	10,564	5,733	7,222	2,536	2,249
Other	0.3	39,369	3,005	3,376	5,856	3,739	3,871	6,670	2,511	6,704	1,621	2,016

Source: (Ghana Statistical Service, GSS, 2012)

Highways being the available mode of transportation brings to thought that at any point in time the Interchange will be patronised by such a great number of people. It can then be established that quiet a number of the population will be pedestrian at any point. Eck (2004) noted that pedestrians are one of the key users of road networks across the globe apart from the automobiles. Pedestrians benefit from transportation infrastructure in terms of health and physical fitness. Subsequently, these fitness benefits are known to reduce the risk of coronary heart diseases like stroke and other chronic diseases. Furthermore, it leads to reduce healthcare costs and improve the quality of life. A community with such number of the disabled should have a built environment ,which will not impede the people with special needs by removing architectural barriers as asserted by Axelson et al. (1999). Meanwhile, Baris and Uslu (2009) averred that in a community where many people are disabled, the probability of the families of the disabled hiding them or keeping them indoors is very high because the urban environment is not conducive for their state. That adds to the reasons why it is very rare to see many disabled people outdoors in our daily lives.

Research Methodology

This research adopted the qualitative approach, where the Sofoline Interchange was adopted as a typical case for the study. The Sofoline Interchange is a full cloverleaf constructed within the Kumasi Metropolitan Assembly. The interchange is designed to prevent pedestrians from using the main arterial of the road, therefore, underground tunnels were integrated in its design.

Basically, the Interchange has three specific groups (i.e. the Client, the Consultant and the Contractor) as the major stakeholders. The study population comprised these groups because they are key to the design and construction of the project, and were in the right position to furnish the researchers with the right information needed for the study. The Works Department of Kumasi Metropolitan Assembly (KMA) was also engaged because they are responsible for the general planning and development of the Kumasi Metropolis. In all, 4 respondents were selected for the study. The four people selected included the Head of the Works Department of the KMA (1), the Head of the Department of Urban Roads, Kumasi (1), the resident Engineer at the Sofoline Interchange representing the Consultant (1), and the Contractor's Quantity Surveyor on the site (1).

A questionnaire made up of open-ended questions were designed for the four major stakeholders involved in the project. A checklist was further designed as a follow-up approach based on the results from the open-ended questionnaire. The checklist was designed using disability friendly standards used in other jurisdiction such as the *"Design of buildings and their approach to meet the needs of disabled people"* (British Standard Institute, 2009), *"Accessibility for the Disabled: A Design Manual for a Barrier Free Environment" (SOLIDERE, 2003) and "Accessible Sidewalks and Street Crossings: A Design Guide"* (U.S. Access Board and Federal Highway Administration Staff, 1999), *"Barrier free design, Public Safety: A National Standard of Canada"* (Canadian Standard Association, 1995). These standards specify the design requirements for infrastructure in the built environment.

Apparently, this work could have limited itself to accessible standards applied for road construction. However, it became extremely imperative to use standards which are also applicable to buildings, because pedestrian tunnels which have the features of buildings are integrated into the design of the Sofoline Interchange. The checklist was designed for the consultant to assess the Sofoline Interchange design as against the various standards for accessible environments. The checklist was prepared as a follow-up to the comments received from the respondents in the questionnaire survey. Content analysis was used to analyse the data obtained from the checklist.

Findings and Discussion

Background information of stakeholders

The questionnaires were administered to the head of the Works Department of KMA, Department of Urban Roads, the major consultants on the project and the senior QS from the construction firms. The respondents were asked about how long their firms have been in operations and their experiences in the construction industry. Information from the consultant and construction firm indicated that, they have all been in existence for more than 15 years and executed more than 30 projects in the construction industry.

However, since the Works Department of KMA and Department of Urban Roads are government organizations backed by an Act of Parliament, the heads in these sections were asked to indicated the major role of their organizations.

> *"plan and develop the city"* (Works Department, KMA)

> *"design, construction, managing and planning of road networks within the Kumasi Metropolis"* (Department of Urban Roads, Kumasi)

From the above information provided by the major stakeholders, it was realized that succinctly all have in-depth knowledge and experience as far as the built environment is concerned.

Stakeholders understanding of 'Equal Access' in terms of road accessibility

The understanding of the stakeholders was sought with regard to the term "equal access". The following were the answers provided by the respondents:

> *"In simple term, equal access is providing access for both abled and disabled"* (Consultant)
>
> *"Equal access is about inculcating or provision of access that can be accessible or usable to both normal and physically challenged people to form part of design and construction of project deliverables in both civil and building construction projects"* (Contractor)
>
> *"Equal access is providing access for road users both able and physically challenged to use the road safely"* (Department of Urban Roads, Kumasi).
>
> *"Is to make sure that people with disability are able to use the road with very little effort"* (Works Department, KMA)

Considering the aforementioned views on the equal access terminology, it was realized that all stakeholders were aware about what the term means by indicating the rationale behind the term through the use of words like "disability, abled and disabled, physically challenged and the …". Notwithstanding, the information provided by the KMA assumed that the physically challenged is just enough to represent the disabled. However, it has been indicated that other forms of disability do exist.

Accessibility of Sofoline Interchange

Respondents were asked about whether any challenges were faced or not during the design of the project. Responses from the respondents unanimously concluded that, challenges were faced in designing the structure to be accessible to all manner of people with disability. Below are some of the challenges faced during the designed stage:

"the initial design had only steps in order to access the pedestrian tunnel" (Contractor).

"audio communications were not included in the design of the pedestrian tunnel" (Consultant).

"*the Sofoline interchange is not designed to accommodate visually impaired"* (Department of Urban Roads, Kumasi).

Table 2 Features of steps design

		YES %	NO %
1	Are there stairs on the access route	❖	
2	Is the stairway for one-man traffic		❖
3	If Yes, is the minimum width of the stair equal to or greater than 0.9m		❖
4	If No, is the stairway for two-way traffic	❖	
5	If Yes, is the minimum width of the stair equal to or greater than 1.5m	❖	
6	Are the risers within the range of 0.1m-0.17m	❖	
7	Does all risers in a flight have the same height	❖	
8	Are the minimum treads equal to or greater than 0.25m	❖	
9	Are the number of steps in one flight within 3-12	❖	
10	Are landings provided in the stairway	❖	
11	If Yes, are the minimum width of the landing less than 1.2m		❖
12	Are the landings provided after the range of the 3-12 steps	❖	
13	Are tactile warning markings provided on the landings		❖
14	Are the noses of the risers rounded	❖	
15	Are the noses of the stair in different colour		
16	Are handrails provided on the stairs		❖
17	Are the handrails on the stairs at least 0.6m high		❖
18	Are curbs provided along the stairs		❖
19	If Yes, are the height within 0.05-0.15m		❖
20	Are the surface of the stairs slip resistant	❖	
21	Is the pitch of the flight greater than 42°		❖

A checklist was further prepared for the consultants using accessible standards. The consultants indicated that, ramps have been added to the design as an after-thought to the initial design. Information provided by the consultants as shown in Table 1 suggest that, other features in the steps design which can aid the visually impaired were also not integrated in the design of the pedestrian tunnel.

Visually impaired features like tactile warning markings, using contrasting colours, handrails and curbs were not incorporated in the design. Probably it comes with extra cost when the visually impaired

features are incorporated in the design of the pedestrian tunnel such as the audio communication.

Conclusion and Further Research

The study considered the accessibility of the Sofoline Interchange which is still an on-going project. The study employed questionnaire and checklist to access information on the major project stakeholders. The study revealed that, the respondents are aware of the accessibility concept (equal access), therefore, disability friendly features were incorporated in the design of the pedestrian tunnel of the Sofoline Interchange. However, the visually impaired were totally ignored in the design of the structure. Based on the major findings it is recommended that disability studies should be incorporated in the curriculum for the various Tertiary Institutions responsible for training built environment professionals. Furthermore, it is recommended that designers should develop a checklist from the various accessible standards to guide them in designing an inclusive built environment.

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