

BRIEF REPORTS

Towards Accessible Built Environments in Universities in Ghana: an Approach to Inclusiveness Assessment

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ABSTRACT

Purpose: *The study aimed to objectively assess the level of inclusiveness of buildings in selected Universities on the basis of international protocols and local legislation that require that buildings should be made accessible to persons with disabilities.*

Method: *A building inclusiveness model, the Composite Disability Design Inclusiveness Score (CDDIS), was used to assess the levels of inclusiveness of 110 buildings in 6 purposively selected Universities in Ghana, using maximal variation sampling.*

Results: *It was found that the buildings of the sampled Universities were not inclusive to a large extent. With one exception, there were variations in the levels of inclusiveness of the buildings in each institution.*

Conclusions: *Irrespective of international protocols and local legislation, the built environments in Universities are not as accessible as they ought to be.*

Limitation: *The CDDIS is a simple quantitative means of assessing the inclusiveness of buildings and allows for objective comparisons. However, it is expected that for purposes of comparison, identical buildings should be used. Any intended use of the CDDIS will require the use of a checklist that is appropriately designed to meet the peculiarities of the particular study.*

Implications: *There is the need for expedited effort to ensure inclusiveness in University built environments. This will help greatly towards the achievement of the Sustainable Development Goals.*

Keywords: *Sustainable Development Goals, disability, Composite Disability Design Inclusiveness Score, access audit.*

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INTRODUCTION

The fourth of the Sustainable Development Goals has as a target the need to build and upgrade education facilities that are child, disability and gender sensitive, and provide safe, non-violent, inclusive and effective learning environments for all (UN Department of Economic and Social Affairs - UNDESA, 2015). This is deemed to be apt because under the social model, disability is seen as the creation of society. Humankind creates barriers in the built environment that result in exclusion of persons with disabilities (Department for International Development-DFID, 2010). Disability has become a human rights and a developmental issue (Oduro, 2009; WHO, 2011; Ghana Statistical Services - GSS, 2013). It is closely related to poverty (Venter et al, 2002; Mont, 2007; Ingstad and Eide, 2011; Mitra et al, 2011; Graham et al, 2013; Lamichhane and Okubo, 2014). People with disabilities are among the world's poorest and least educated citizens (Groce, 2005; Groce, et al, 2011). In fact more than 80% of people with disabilities live in poverty (UNDESA, 2015). Education which can reverse the positive relationship between disability and poverty (Barton and Armstrong, 2001; Gibilisco, 2010; WHO, 2011a; Lamichhane and Okubo, 2014) is itself an area of concern. The United Nations (2007) reports that accessibility challenges are among the barriers to the education of people with disabilities especially in developing countries. These include inaccessible built environments. Oyaró (2015) further states that people with disabilities have limited access to education because of structural and other social barriers. The issue of inclusive and accessible built environments in educational institutions is therefore of paramount importance. Accessible built environments are a necessity for a better future for people with disabilities in particular and humankind as a whole (United Nations, 2013). The CRPD (2006) accordingly states that steps should be taken to ensure that built environments are accessible to persons with disabilities. Similarly, one of the strategies of the 2030 Agenda for Sustainable Development to end poverty points to the need for the provision of inclusive and accessible educational institutions.

Addressing disability as a human rights concern, the United Nations Universal Declaration on Human Rights recognises the rights of all members of the society including those of persons with disabilities. Article 26 of the Declaration also addresses the fundamental right to education for all persons. Ghana has signed the Convention on the Rights of the Child (CRC), the African Charter on Human and Peoples' Rights (ACHPR) and the United Nations Convention on the Rights of Persons with Disabilities (CRPD), all of which promote the rights of persons

with disabilities (Gyamfi, 2014). The CRPD specifically guarantees the rights of people with disabilities as equal citizens who should not be discriminated against and who should have equal access to every place that the public has access to. Ghana's Constitution and other enacted legislations also guarantee the rights of people with disabilities. Furthermore, in 2006, the country enacted its Persons with Disability Act 715 which among other things gave a moratorium of 10 years for all public buildings to be made accessible to persons with disabilities. These public buildings include University buildings. Therefore, the current paper sought to determine the level of inclusiveness of University buildings in Ghana. It builds on the model of Lau et al (2014) and adds to existing knowledge in the area of assessing the level of inclusiveness of buildings for persons with disabilities.

Access Audit

An access audit is undertaken to establish how well a particular building or environment performs in terms of access and ease of use by a wide range of potential users including persons with disabilities and to recommend access improvements (Sawyer and Bright, 2007). It examines an existing building against predetermined criteria (Amos-Abanyie et al, 2012). In Malaysia, according to Kamarudin and Ariff (2014), there are access audit consultants who offer training and the participants are expected to conduct the real access audits successfully.

Various means have been used to determine the accessibility of the built environment. In 1998, Chard and Couch (1998) understood from some students with disabilities what their challenges were in the built environment. They used the information as a basis to undertake audit of buildings in the University of Liverpool. Kane et al (2002) developed an appraisal model for external environments based on their study in Belfast. They used percentages for the appraisal of the elements in the built environment of the estate. Bendel (2006) worked on an information system that provided among other things, analysis and decision support for the evaluation of accessibility of facilities for persons with disabilities and the elderly that had consistent, up-to-date and reliable information. Wu et al (2007) in their study attempted to come up with a quantitative approach, the analytic hierarchical process, to ascertain accessibility of the built environment. They touched not only on the physical or design aspects but also on the management aspects. Lau et al (2014) in their assessment of the inclusiveness of the University of Hong Kong used the Building Inclusiveness Assessment Score and noted that weighting of the inclusion attributes resulted

in objective assessment. Lau et al (2014) also espoused the cause of building inclusiveness assessment.

Situation in Ghana

A review of papers written on disability issues related to the built environment in Ghana over the past five years (2011-2016) revealed that 3 out of 13 focussed on buildings of tertiary educational institutions (Table 1).

Table 1: Recent studies in Ghana

Authors	Year	Title	Type	Region	Focus
Sasu A., Asante L.A., and Gavu E. K	2016	Physical Access for Persons with disability in rented compound houses in Kumasi: evidence from selected neighbourhoods in the metropolis	Journal article	Ashanti	Residential accommodation
Danso A.K. and Tudzi E.P.	2015a	Consultants and Users: Who is Right on the Accessibility of Accra Road Interchanges?	Conference paper	Greater Accra	Roads
Danso A.K. and Tudzi E.P.	2015b	Inclusive access to Accra shopping malls	Conference paper	Greater Accra	Shopping Malls
Ashigbi E. K. Y., Danso A. K. and Tudzi E. P.	2015	Persons with Disabilities and the Built Environment: A User Perception of the University of Ghana	Journal article	Greater Accra	University PWDs
Danso A.K. and Tudzi E. P.	2015c	Promoting education on inclusive design of the built environment at KNUST	Conference paper	Ashanti	Curricula
Dwirah S., Opoku R., Obuobi A. L., Saafa P. T., Agyekum- Boateng F. and Tudzi E. P.	2015	Management policies for accessible environment in senior high schools	Conference paper	Ashanti	Senior High Schools

Gavu E.K., Tudzi E.P. and Shani A.S.	2015	The level of accessibility of tertiary educational facilities in Ghana after the passage of the Persons with Disability Act 2006, Act 715	Conference paper	Ashanti	Public University buildings
Danso A. K., Ashigbi E. K. Y. and Tudzi E. P.	2014	Mobility Challenges of Persons with Disabilities (PWDs) at the University of Ghana.	Conference paper	Greater Accra	Public University buildings
Ansah S.K. and Owusu K.	2012	State of Public Buildings in Ghana after the Passage of the Persons With Disability Act (Act 715): The Case of Tertiary Institutions	Journal article	Central and Western	Public University and polytechnic buildings
Amos- Abanyie S., Poku-Boansi M. and Duah D. Y. A.	2012	Improving Ramp Design As A Barrier-Free Access In Public Buildings In The Kumasi Metropolitan Area, Ghana	Journal article	Ashanti	Public buildings
Danso A.K., Owusu- Ansah F.E. and Alorwu D.	2012	Designed to deter: Barriers to facilities at secondary schools in Ghana	Journal article	Country-wide except Eastern and Upper West	Senior High Schools
Danso A. K., Ayarkwa J. and Dansoh A.	2011	State of Accessibility for the Disabled in Selected Monumental Public Buildings in Accra, Ghana	Journal article	Greater Accra	Public buildings
Tudzi E. P. and Frimpong- Asante J.	2011	Sports Facilities and the Physically Challenged	Conference paper	Western and Ashanti	Sports Stadia

On methodology, most of the papers that focussed on the built environment used checklists culled from international standards to assess the buildings under study and reported in percentages, frequencies and charts. They were supported in some cases by pictures and observations. Other instruments used for data collection in these studies were questionnaires and interviews. The study on curricula also involved analysis of course contents.

The major finding on the built environment in most of these cases was that it was generally not inclusive. The study of University curricula also reported that the curricula did not lay emphasis on inclusive designs. Conspicuously left out were studies on private Universities and Universities (both public and private) in the northern parts of Ghana, an area generally considered to be comparatively deprived and also having very high illiteracy levels among people with disability (GSS, 2013). Generally, the building assessments did not go beyond reporting the frequencies, percentages and the use of charts. It became apparent that there was the need to go beyond these to determine how accessible University campuses were in Ghana.

Objective

The purpose of the current study was to construct an index or model for inclusiveness assessment, and subsequently use it to assess buildings in selected Universities in Ghana.

METHOD

Research Design

A non-probabilistic approach (i.e., purposive sampling) was used in selecting six Universities for the study, while a probabilistic approach (i.e., stratified random sampling) was used to select buildings for the assessment of their levels of inclusiveness. The inclusiveness of each University was subsequently ascertained using the Composite Disability Design Inclusiveness Score (CDDIS).

Sampling

The study involved three public Universities and three private Universities in Ghana, purposively selected from among the 10 public universities and 35 private Universities as per the records of the National Accreditation Board (www.nab.gov.gh, 2014). The maximal variation sampling method was used to select specific universities within the private and public University categories. According to Creswell (2012), maximal variation helps to present various perspectives of a phenomenon being studied and as a result brings out the needed depth. Here, the researcher identifies cases that differ on certain predetermined characteristics and studies various sites that depict different dimensions of the characteristic. Guided by this, Ashesi University College (AUC), Catholic University College of

Ghana (CUCG), Christian Service University College (CSUC), Kwame Nkrumah University of Science and Technology (KNUST), University for Development Studies (UDS) and University of Ghana (UG) were purposively selected for the study (Table 2). The sample size of six Universities in this study was in consonance with the studies conducted by Olanrewaju (2012) and Lau et al (2014).

Table 2: Characteristics of Institutions

Institution	Characteristics
AUC	It is ranked first among the private Universities in Ghana. According to the Webometric ranking, it ranks 80th in Sub-Saharan Africa. It has a built environment with unique designs. It is located in the Eastern Region of Ghana.
CSUC	It is an old private theological institution with old structures. It was recently upgraded to University status and new structures are being developed. It is located in the middle belt of the country. It ranks as the 7th private University in Ghana. In Sub-Saharan Africa, it is 242nd.
CUCG	It is the 310th in Sub-Saharan Africa and the 9th private University in Ghana according to the Webometric ranking. It is a new private institution with relatively very new buildings and it is located in the in the middle belt of Ghana.
KNUST	It is an old public University which is ranked as the second University in Ghana and the 17th in Sub-Saharan Africa according to the Webometric ranking. It is the premier Science and Technology institution with Departments that run programmes on the built environment. It is located in the middle belt of Ghana. It has a lot of buildings; both old and new. Some of its old structures are up to eight storeys high. It also has a Centre for Disability and Rehabilitation Studies.
UDS	It is a relatively new public University located in the Northern parts of Ghana. Its campuses are located in the Upper West, Upper East and the Northern regions of Ghana which are generally considered to be comparatively less developed. Its buildings are generally newly constructed except in few instances where the campuses of older institutions were taken over. It is ranked as the fifth best public University in Ghana and the 145th in Sub-Saharan Africa according to the Webometric ranking.
UG	It is touted as the premier University in Ghana. It is public. It is located in the southern part of Ghana. It has a lot of buildings. Most of them are old with a maximum height of three storeys. There are newer ones some of which go beyond the third floor. It has a well-organised Office of Students with Special Needs that attends to the needs of persons with disabilities. On the Webometric ranking, it is the 13th in Sub-Saharan Africa and the first public University in Ghana.

Source: Researchers' construct, 2016 and <http://webometrics.info/en/Sub-Saharan> 2014

For the private Universities, because of the relatively low number of buildings, all the major buildings that were not staff residential units and were frequently used by students were targeted for the building assessment. In the public Universities, because of the larger numbers and different types of buildings, the stratified random sampling approach was adopted for the buildings that were assessed. There was stratification to enable inclusion of structures in all the relevant major use areas. The strata comprised administration blocks; lecture halls; laboratories and examination centres; libraries and ICT facilities; halls/ hostels; auditoriums; commercial facilities; religious facilities; sports facilities and health facilities. It was observed that in some instances a building served more than one purpose; in such a case, it was categorised under the predominant use. Specific buildings were then selected for assessment within each stratum. With stratified sampling, the population is divided into a specified set of strata such that the members within each stratum have similar attributes but the members between strata do not have similar attributes (Panneerselvam, 2008).

Data Collection

Data was gathered in 2015. All 110 buildings were assessed. They consisted of 30 buildings each from the three public Universities and a total of 20 from the three private Universities (Table 3).

Table 3: Statistics on CDDIS

STATISTICS (%)	UNIVERSITIES					
	PRIVATE			PUBLIC		
	AUC	CUCG	CSUC	KNUST	UG	UDS
Maximum	47.71	25.95	33.40	49.43	39.92	43.89
Mean	46.91	21.92	25.10	27.61	27.11	21.38
Median	47.71	21.76	25.77	26.82	27.72	19.95
Minimum	43.70	16.60	17.94	12.02	11.27	6.11
Standard Deviation	1.79	3.98	6.29	8.02	7.15	10.49
Interquartile Range	0.00	8.58	11.17	10.30	10.67	18.32
No. of buildings	5	7	8	30	30	30

Source: Researchers' construct, 2016

The number of institutions and buildings selected in the current study is justified by the number of buildings included in the study of Lau et al (2014), who assessed 48 buildings from 4 Universities in Hong Kong for 'Assessing the Disability Inclusiveness of University Buildings'. Based on the information on the checklist, each selected building was visited. For each attribute, the requisite parameters were assessed and the data was collected accordingly. This is further buttressed by other authorities (Chaudhuri and Stenger, 2005; Creswell, 2012; Saunders et al, 2012).

Composite Disability Design Inclusiveness Score (CDDIS)

With the focus of the study being the ability to ascertain the levels of inclusiveness of the Universities under study, a building inclusiveness model christened Composite Disability Design Inclusiveness Score (CDDIS) was used. The CDDIS assessment involved two stages. First, there was the design of the checklist mainly from the British Standards (BS8300:2010) which was used to evaluate the buildings. International standards are primarily resorted to by construction professionals in Ghana since the country does not have her own (Danso and Tudzi, 2015a). Note was taken of the guiding principles of verifiability, measurability, flexibility, relevance and being observable (Lau et al, 2014). Percentages were used just as Kane et al (2002) did in their appraisal model of estates. The checklist had 15 attributes with a number of operating parameters under each attribute. To ensure that the operating parameters were consistently evaluated, a rating scale from '0 - 4' was used in the checklist. The definitions for the scale values are presented in Table 4.

Table 4 – Definitions for scale values

Value	Definition
0	no operational parameter existed to meet the requirements for an attribute
1	less than 40% of an operational parameter met the requirement for an attribute
2	40% to 69.99% of an operational parameter met the requirement for an attribute
3	70% and above (but not 100%) of an operational parameter met the requirements for an attribute
4	100% of an operational parameter met the requirements for an attribute

Source: Researchers' construct, 2016

The second stage was the calculation of the CDDIS. For the purpose of easy assessment, the scores for each building attribute were combined into an index.

Thus, the CDDIS is the weighted standardised ratings of the attributes (and the parameters) that affect the disability inclusiveness of the buildings. While the index of Lu et al (2014) captured physical and visual disability separately and in two stages, CDDIS takes into consideration all the categories of people with disabilities together per the Solidere (2004) at one go. The rationale is that the principle underlying inclusiveness and non-discrimination is to allow equal access to all manner of persons to places accessed by the public. Ideally, there should therefore not be a built environment for one category of persons and another for another category of persons. This is even more important in Universities as they are meant to provide inclusive and equitable quality education. In effect, an inclusive building should at least be able to meet the basic requirements for all manner of persons/ users at one and the same time. The CDDIS also provides the inter- quartile ranges for buildings being assessed. Lau et al (2014) introduced the element of management, but that is not in the CDDIS because of conditions prevailing in Ghana. Here, the practice of managing the facilities of the Universities is still at the developmental stage in some institutions. Accordingly, the CDDIS addresses the design component.

Mathematically,

$$CDDIS_k = \sum_{i=1}^{15} W_{ki} F_{ki}$$

Here CDDIS is the CDDIS of building k; W_{ki} ($i=1,2, \dots,15$) is the non-negative weighting of the i th inclusion attribute of building k related to disability.. F_{ki} ($i=1,2, \dots,15$) is the standardised ratings of the i th inclusion attribute of building k.

The scale for each F_{ki} ranges from 0% to 100%. It is standardised by taking a ratio of the total score attained for a particular attribute to the maximum attainable for that attribute. The attributes covered were parking; access routes to and around buildings; external ramps; external steps/ stairs; entrance of building; corridors and passages; doors; internal steps and stairs; internal ramps; elevators; fire safety; communication/ signage; sanitary accommodation; toilet facilities; and bath/ shower facilities. The number of operational parameters under each attribute varied. It was dependent on operational parameters of the said attribute in the Standards that were considered to be most relevant and fundamental to the needs of the people with disability in the light of this study in particular and the

peculiar conditions prevailing in Ghana in general. These operational parameters could be objectively assessed.

Statistical Analyses

The descriptive statistics (i.e., median, interquartile range, etc) and non-parametric (signed rank test) statistical methods were used in this study. The statistical software used for the analyses was the Statistical Analysis System (SAS 9.1).

RESULTS and DISCUSSION

The major findings from the study are presented and discussed below.

Maximum and Median CDDIS

The CDDIS of the buildings that exhibited the highest levels of inclusiveness in each University have been presented in Table 3. The highest in the study was the Jubilee Mall at KNUST with CDDIS of 49.43 %. It was commissioned on 19th December 2014. The hostels at AUC came next with 47.71 %. Construction commenced in January 2010 and they were completed in May 2011. The UDS Main Administration block in Tamale came next with 43.89 %. The facility was commissioned on 19th April 2010. The Balme Library was University of Ghana's most inclusive building, with a CDDIS of 39.92 %. The year of construction was unavailable but it had seen retrofitting over the years to make it more inclusive. The maximum for CSUC came next with the Executive Hostel at 33.40 %. It was constructed in 2011. The maximum for the CUCG was for the Resource Centre which had a CDDIS of 23.4%. Construction activities on the building commenced in 2007 and landscaping was going on at the time of this study. It was accordingly observed that a high level of inclusiveness was not the preserve of any particular use category or stratum.

The median CDDIS for each campus gives a better reflection of the state of inclusiveness of the buildings in the University. AUC had the highest median (47.71 %), followed by UG (27.72 %), KNUST (26.82 %) and then CSUC (25.77 %). CUCG came next with 21.76 % and then UDS with 19.95 %. The median of the inclusiveness of the buildings in all the Universities was 26.30% (Table 3).

The results of the study indicate low CDDIS for the buildings. This was further confirmed by the median values that were all below 30 % except those of AUC which may be described as an outlier because of the unique design of that

campus. This paints a rather gloomy picture and requires that actions toward inclusiveness should be facilitated. The findings on the generally inaccessible University built environment also agree with those of Okolie and Ogunoh (2013) in Nigeria, and Fidzani et al (2013) in Botswana.

Interquartile Range (%) and Signed Rank Test

As shown in Appendix 3, the interquartile range was 0.00 for AUC which indicates that there was no variability in the levels of inclusiveness among the buildings studied there. This was followed by 8.58 for CUCG, 10.30 for KNUST, 10.67 for UG, 11.17 for CSUC and 18.32 for UDS. The average interquartile range for the private Universities was 6.58, which was better than the public Universities where the range was 13.10.

The skewness was generally indicative of the non-parametric nature of the data. Therefore, to come up with an objective way of ascertaining the differences in the levels of inclusiveness in the Universities, a Signed rank test was conducted. The null hypothesis of 'no difference in CDDIS with respect to the buildings' was rejected with p-values of 0.00 at the significance level of 0.05 for KNUST, UG and UDS. The p-value was 0.008 for CSUC and 0.016 for CUCG. Thus, it may be concluded that there are differences in the levels of inclusiveness of the buildings. However, at AUC, the null hypothesis of 'no difference in CDDIS with respect to the buildings' was accepted with p-value of 0.063. The conclusion is that there are no differences in the levels of inclusiveness of the buildings at AUC.

The study accordingly establishes that the interquartile range which indicates the extent of variability in the buildings under study was better for the private Universities than the public institutions. This indicates that buildings have wider variations in their levels of inclusiveness in the public institutions than in the private Universities. Reasons that could be adduced to this include: funds for construction in the private institutions come essentially from one end user (the University) as against the public ones where the funds come from a number of users or sub-components like Departments, Faculties and Colleges as end users. Different end users are expected to request different designs to suit their tastes. Hence in a situation where there is no central unit to insist on the inclusiveness of all designs in the entity (University), or where such a unit fails so to do, or where there is no disability policy in the institution to dictate the same, then there are likely to be wider margins of variability. Secondly, the level of development control and regulatory authority that is brought to bear on developments in

the Universities would play a major role in reducing the extent of variability in the inclusiveness levels of the buildings in the various Universities. The public Universities in Ghana have a certain degree of autonomy in this regard as per their Acts of incorporation. Finally, the levels of variability in institutions like UDS and CSUC could also be the result of having a mix of very old and relatively new structures due to their developmental history. In this instance, any subsequent study that purposively selects only modern structures especially those that were developed after 2006 may not find such a wide range. For the purpose of this study however, and for the fact that the students use all the structures, their inclusion in the current study is justified. Bon (1994) notes that real property performance should be measured with the objective of gradually changing the character of the entire portfolio via continual managerial action bent on improving real property performance.

Heterogeneity Factor

The study found that the CDDIS had a limitation in comparing the inclusiveness of buildings for different uses. Unsurprisingly, this had to do with the heterogeneous nature of buildings. Bon (1994) noted that cross-sectional comparisons of buildings are difficult because of their heterogeneity. To ameliorate this limitation, comparison of individual buildings should ideally be between buildings with similar attributes, or between buildings which are within the same stratum. This challenge notwithstanding, the CDDIS obtained gives a fair picture of the levels of inclusiveness of the Universities since the institutions were the focus of this study, and not the comparison of individual buildings per se.

CONCLUSION

The use of the CDDIS presents an objective means of assessing and comparing levels of inclusiveness. It results in a holistic and thorough study of the buildings. It is a simple but rigorous and objective quantitative assessment of buildings thus affording a good basis for comparison of their levels of inclusiveness. Nonetheless, it is always necessary that because of the heterogeneity of buildings, the choice of buildings for any comparative study should be as similar as possible. From this study, it has been found that the overall median disability inclusiveness performance of the buildings in the Universities is low (26.82%). There are differences in the levels of inclusiveness with respect to the various buildings in the Universities except for AUC. In sum, the evidence from the study suggests

that although there are International protocols and local legislation to ensure inclusive built environments, the Universities are not as inclusive as expected. This implies that there is serious need for enforcement of the provisions of the International protocols and the Persons with Disability Act of 2006.

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