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Assessing the Level of Compliance to the Use of Pedestrian Bridges in Minna, Niger State

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Abstract

Traffic safety is as important as other issues in human life because traffic problem is the next cause of human death following cancer and other deadly diseases of the world. Pedestrian bridges are structures constructed for the purpose of allowing pedestrians to cross varieties of road without being exposed to the risks of accidents of any kind. Despite the existence of pedestrian bridges in Minna, it is observed that pedestrians still do not adhere to its use. This study aims at assessing the level of compliance to the use of pedestrian bridges in Minna. The study adopted both qualitative and quantitative analysis. Seven (7) pedestrian bridges were identified and used for the study. It was found that functionality in terms of usage is low (38.6%) where about 38% of the respondents opined that using pedestrian bridges is time and energy wasting despite the fact that 81% agreed that pedestrian bridges are useful and important. The study observed that the commonest reason people do not use pedestrian bridges in Minna is because they feel it is time consuming (26.1%). This indicates low level of compliance. The study concludes that pedestrian bridges are greatly under-utilized in Minna as 61.4% of the populations avoid using the pedestrian bridges while recommending adherence to pedestrian bridge use through construction of barricades on road divides/island on pedestrian bridges location among others. This will eventually reduce road traffic accidents involving pedestrians in Minna.

Keywords: Bridge, Compliance, Functionality, Pedestrian, Traffic.

1. INTRODUCTION

The issue of traffic problem and traffic safety has been a major concern to every urban area in the world at large. Easier and better ways of eradicating accidents in the society are thought of so as to secure the lives of children, young adult and old people in the society. Road Traffic Accident (RTA) occurs when a road vehicle collides with another vehicle, pedestrian, animal or geographical or architectural obstacle (Olatunji et al., 2011). This implies that traffic includes pedestrians, vehicles and other means of movement on roads. The world faces big challenge of traffic accidents that terminates millions of human lives annually, especially in the urban area. The consequence of these traffic accidents is one of the wicked problems of the world because it affects individual lives and extends to having negative impact on the community and its development (Abojarideh, 2013).

Traffic safety is seen as universal problem and according to United States National Highway Traffic Safety Administration (2015), the death of individuals between the ages 1-34 years are mostly caused by vehicular accident. Vehicular accidents involving pedestrians is usually fatal because they are usually not shielded unlike being in a vehicle.

Pedestrians, defined by Oxford Advanced Learner's Dictionary are persons walking in the street and not travelling in a vehicle. Pedestrians are mostly exposed to danger especially during the week days due to the numerous activities that takes place within the week such as people's livelihood, educational and religious activities in locations with high population density or population-attracting activity such as school, religious, sporting facilities, etc., facilities for safe road crossing of pedestrians cannot be undermined.

Pedestrians require bridges as means of crossing to the other side of the road without interfering

with traffic flow and risking accident. Pedestrian bridges are structures constructed and elevated for the purpose of allowing pedestrians to cross varieties of road without being exposed to the risks of accidents of any kind therefore creating an intersection that prevents vehicles from meeting pedestrians. Okafor (2017) stated that pedestrian accident is one of the major problems facing Minna metropolis. Countless number of accidents involving pedestrians occur in the city. The relevance of pedestrian bridges in pedestrian accident reduction cannot be undermined. According to the data from 2014 – 2017 obtained from the Niger State Command of the Federal Road Safety Corps (FRSC), the number of road crashes involving pedestrians has reduced drastically since the construction of the new pedestrian bridges. It can be implied from this that the more pedestrian bridges has a correlation with accident reduction.

A number of researches such as Ohakwe et al. (2011) have anticipated that the cause of pedestrian accidents are due to over speeding, bad road, drunk driving, faulty vehicles, ignorance of pedestrians to traffic rules and many more. The issue of reducing the numbers of pedestrian accident or if possible, eradicating it has been the major problem for both individuals and government. Pedestrians are usually prone to accidents and they represent 70% of traffic accidents in most developing countries (Jordan Traffic Institute, 2010). However, with the existence of pedestrian bridges in Minna, pedestrians as observed still do not adhere to its use. The old pedestrian bridges in Minna do not meet the functional requirement such as adequate pedestrian bridge width, physical appearance and location. The recently constructed pedestrian bridges are better in terms of physical appearance, width and target location. Hence, the purpose of this study is assessing the level of pedestrian compliance on the use of pedestrian bridges in Minna.

Presence of facilities in a particular area helps to boost the growth of people in that particular environment. Hence the beauty of any pedestrian bridge serves as a pull factor to its use and the area. This idea works in conjunction with the appearance, type, location, configuration and

convenience of pedestrian bridge. According to Gehl (2011), an important form of transportation in urban areas are pedestrians. Pedestrian's need should be considered as an integral part of the road transport system. In order to see the effectiveness of the pedestrian facilities usage especially pedestrian bridges, it is necessary to assess the feasibility of facilities from pedestrian's point of view as well as the design standard requirement of pedestrian facilities, and to assess the level of its usage. However, the concept of level of services (LOS) is widely used in road traffic planning as well as in planning for pedestrian traffic and events (Kretz, et al., 2011). It is expected that there should be high level of compliance to pedestrian bridge use.

In spite of pedestrian bridge functioning effectively, there still exists pedestrians who cross the road without using it. An assessment of the effectiveness of bridge use reveals that it has not been utilized effectively. According to Kretz et al. (2011), only half in the number of people in Jakarta uses the bridge; everyone else crosses the street on the road pavement. The assessment of geometric feasibility emphasizes the need to improve the geometrics of sidewalk and the pedestrian bridge. This includes the width, the rise, the slope of the bridge, and the width of the sidewalk in several segment in order to increase the space provided encourage pedestrians to use the bridge. The result of this assessment demonstrates the need for facilities that accommodate pedestrians better, and for more intensive law enforcement measures to help increase the effectiveness of the pedestrian bridge and the reduction of vehicular flow impediments from pedestrian movements.

According to the World Health Organization (2013), more than 270,000 pedestrians in the world lose their lives on road accidents yearly which results to 22% of the total 1.24 million road traffic death. In spite of the magnitude of problems, most efforts of minimizing pedestrian deaths had generally focused only on education and traffic regulation. Aworinmi et al. (2010) discussed the major causes of road traffic accident where he stated that human, vehicle, roadway and environment have significant contribution of about 79.4% on the road traffic accident.

United State Department of Transportation (2002) opined that pedestrian bridge can address real or supposed safety issues by providing users a formal means for crossing "problem areas" such as deep valleys, waterways major transportation corridors. American Association of State Highway and Transportation officials (2004), stated that structures are built in response to user demand for safe crossings where they formerly did not exist. For instance, a pedestrian bridge may be suitable where moderate to high pedestrian or bicycle demand exists in order to cross a freeway in a specific location.

According to THE NATION newspaper report of 2nd May, 2015, being aware of the risks involved is not enough to discourage people from cross the expressways without using pedestrian bridges. Some of the reasons for not using pedestrian bridges as identified by the report include: acrophobia, lack of warning signs, health issues, structural defects (high risers - steepness), insecurity especially at night, non-consideration of physically challenged and location.

Despite the existence of about 650 pedestrian bridges all over the city of Tehran, the bridges have low functional efficiency resulting from poor physical appearance of the bridges (Beautification Organization of Tehran, 2010). This implies a correlation between functionality and physical appearance of the pedestrian bridges (Nikoomaramet al., 2008). Other problems of low use of pedestrian bridges include the unsuitable location of the bridges, lack of legal tools (or laws enforcing the use of pedestrian bridges), lack of a strong culture for pedestrian bridge use, inadequate sense of safety concerning the bridges, lack of thermal relief when passing the bridges, not caring about the future growth thereby subjecting bridges to lose their functionality through the time and finally neglecting the beauty or visual qualities of the bridges.

In Awka Nigeria, a study of pedestrian safety was examined through direct observation and a peak hour volumetric count of both vehicles and pedestrians at selected locations using manual counting. It revealed that about 34% of the pedestrians still prefer to cross on the carriageway

instead of using the pedestrian bridge where available (Chidozie et al., 2017).

1.1 Study Area

The Study area is Minna metropolis; the capital of Niger State in North Central Nigeria, one of Nigeria's 36 federal states and is the headquarters of Chanchaga Local Government Area (Niger State Statistical Year Book, 2011). It lies between Latitude 9° 33' and 9° 40' North of the Equator and Longitudes 6° 29' and 6° 35' East of the Greenwich Meridian on a geological base of an undifferentiated basement complex of mainly gneiss and magnetite (Maxlock, 1979). The state has an area of about 76,363km².

In Minna, the main idea to the construction of pedestrian bridges was to save the lives of the city dwellers without considering the visual appearance of the pedestrian bridges and to ease the traffic congestion in the area. Nevertheless, most of the bridges are grossly under-utilized and this is due to the relationship between the functionality and the attractiveness of the pedestrian bridges.

2. MATERIALS AND METHOD

Both primary and secondary sources were employed for data collection. The primary data was obtained through questionnaires and physical observation while the secondary data were from journals, internet and government agencies. The study adopted a purposive sampling technique where the sampling elements are the people crossing the roads not using the pedestrian bridges. The data for Bosso market pedestrian bridge being the busiest of the seven pedestrian bridges was extrapolated for other pedestrian bridges. The sampling frame are the people crossing the road within 20 meters of Bosso pedestrian bridge.

Prior to the survey day, an inventory of the number of people that crosses the road within 20 meters of the Bosso pedestrian bridge was carried out. This was done midweek (Wednesday) in the peak hours of morning (7 - 9 am), afternoon (2 - 4 pm) and in the evening (5 - 7 pm). The inventory revealed that a total of 704 people crossed the road within 20 meters of the pedestrian bridge. Using the online sample size

calculator and confidence level and interval of 95% and 7.26 respectively, the sample size is 145 implying an average of seven questionnaires each in the three stated peak hours for the seven pedestrian bridges in Minna.

Seven days after the inventory, the survey proper was conducted in the same three stated peak hours of the seven pedestrian bridges in Minna in order to determine the proportion of people complying and those not complying with the use of the pedestrian bridges. GPS device (GARMIN GPSmap 60Cx) was used to locate the coordinates of the existing pedestrian bridges while ArcGIS

10.2 software was employed in mapping their spatial distribution. The use of Likert scale and descriptive tools (Tables) of SPSS were undertaken in the analysis.

3. RESULTS AND DISCUSSION

The study used seven (7) pedestrian bridges within the study area. Their locations include Kure market, Bosso market, former NYSC camp at Angwan Daji, Government Girls' Day Secondary School at Angwan Daji, Mobil roundabout, Niger state College of Education, Shango and also at Bahago roundabout with their coordinates shown in Table 1 and Figure 1.

Table 1: Location and Coordinates of Pedestrian Bridges in Minna

S/No.	LOCATION	EASTING	NORTHING
1	Kure market	1063778	0228818
2	Bosso market	1068062	1068062
3	Former NYSC Camp	1064950	0230661
4	GODSS	1065224	0230630
5	Mobil round about	1063668	0230873
6	Niger State College of Education	10558394	0233883
7	Bahago roundabout	1066460	0230268

Figure 1 shows the location of pedestrian bridges in Minna. Most of the bridges (i.e. six of the bridges) are located along the main spine of the study area (Bosso-Minna-Chanchaga corridor). Only one pedestrian bridge is located along the western by-pass which is at Kure market.

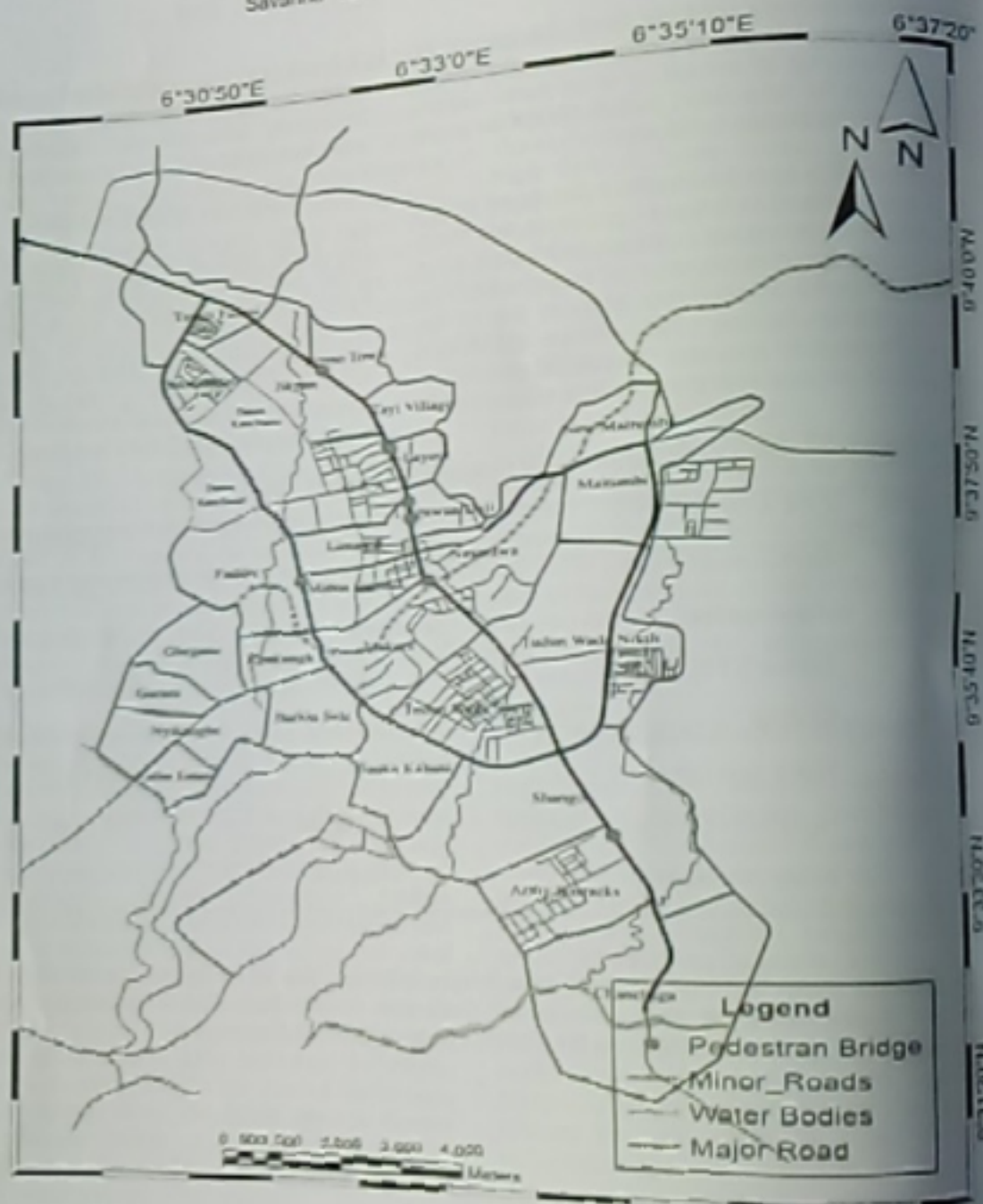


Figure 1: Spatial Distribution of Pedestrian Bridges in Minna

3.1 Pedestrian bridge appearance and construction materials

The materials used for the construction of all the pedestrian bridges in Minna are mostly made of steel and concrete base to receive steel structures

but the recently constructed ones at Mobil, Karc market and Niger State College of Education, have plastic roof covering (Plate I), iron plates were used for floor and steps of the walk way (Plate II).



Plate I: Recent Pedestrian Bridge in Minna Plate II: Width of the Recent Pedestrian Bridges

Pole pipes and wire mesh were used for the construction of hand rails for both adult and children bridge users' protection (Plates III and IV).



Plates III and IV: Construction Materials of Old Pedestrian Bridges in Minna

From the foregoing, the recently constructed pedestrian bridges are better and more visually pleasing in appearance. Their roof, the span and the finishing makes them more aesthetically pleasing than the old ones. The old bridges are

steeper, and since they are not having roofs over them with steel walkway, are usually hot to use during hot weather implying that they do not ensure thermal comfort.

3.2 Anthropometrics and Ergonomics of the Pedestrian Bridges

The configuration of the human body especially size and relationship of space requirements are important factors to be considered in the construction of pedestrian bridges. It was discovered that the width of the bridges located at Bosso market, GGDSS and former NYSC camp Angwan Daji are 1.3m while that of Bahago roundabout is 1.2m. These width dimensions would not allow very free passage of two or more pedestrians at a time. However, the width of the

new pedestrian bridges located at Mobil round about, Kure market and Niger State College of Education are 2m in compliance to the principles of ergonomics.

The implication is that the design and construction of the old pedestrian bridges in Minna did not consider anthropometry as well as the population of intended users. Also, the taking off base and risers of the pedestrian bridge in Plate V did not consider the aged people as well as the physically challenged.



Plate V: Steepness of the Old Pedestrian Bridge in Minna

The newly constructed pedestrian bridges which were constructed in the third quarter of the year 2016 in Minna used ergonomic principles. The pedestrian bridges allow for convenient and safe

movement of pedestrians (Plate VI). The capacity of the newly constructed bridges allows for easy passage of three pedestrians simultaneously side shoulder-to-shoulder.



Plate VI: Width of the New Pedestrian Bridges in Minna

3.3 The Use and the Opinion of People towards Pedestrian Bridges in Minna

The opinion of the people towards the use of pedestrian bridges in Minna was sampled in order to discern the percentages of people that use and do not use the bridges. As indicated in Table 2 the proportion of the population that do not use pedestrian bridges is 61.4% while 38.6% use pedestrian bridges. This shows that the level of

Table 2: Level of Pedestrian Bridges Use Compliance in Minna

Variable	Frequency	Percentage
Use pedestrian bridge	56	38.6
Do not use pedestrian bridge	89	61.4
Total	145	100

non-compliance is higher than that of the level of compliance in the use of pedestrian bridge in Minna as more than half (61.4%) of the respondents do not use the pedestrian bridge. The implication is that a lot of sensitization needs to be done on the dangers of abandoning the use of pedestrian bridges meant to save people especially pedestrians from accidents involving vehicles which is usually fatal and at times ghastly.

Analysis of people's opinion towards pedestrian bridge use was done using Likert scaling by Renais Likert (1932) as summarized in Table 3.

Table 3: Public opinion of pedestrian bridges in Minna

Opinion	5	4	3	2	1	TWR	Mean	Index	Rank
Pedestrian bridges are useful and important	58	63	5	11	8	587	4.05	0.81	1st
Barricades aid compliance of pedestrian bridge use	35	65	21	15	9	537	3.70	0.74	2nd
Sign post aid compliance of pedestrian bridge use	22	62	18	31	12	486	3.35	0.67	6th
The renovation of pedestrian bridge	27	65	22	22	9	514	3.54	0.71	3rd
Enforcement agents will aid compliance	26	59	23	27	10	499	3.44	0.69	4th
Considering physically challenged people would aid compliance	21	64	29	24	7	503	3.47	0.69	4th
Wasteful using the pedestrian bridge (time and energy)	27	38	5	43	32	420	2.90	0.58	7th

5 = Strongly agreed; 4 = Agreed; 3 = Indifferent; 2 = Disagreed; 1 = Strongly disagreed

TWR = Total Weighted Response

3.4 Reasons for Non-Compliance to Pedestrian Bridge Use in Minna

The analysis of the reasons people do not use the pedestrian bridges in the study area is shown in Figure 2. It reveals that most people (26.1%) in Minna do not use the pedestrian bridge because

they feel its time consuming and stressful. About 19.3% had no identified reason for not using the pedestrian bridge. Acrophobia (fear for height) is the reason 14.8% do not use the bridges, 11.4% see the location as useless probably because some are far from the people while the physical

appearance of the bridges represented by 8%. Equally, 8% opined that such bridges are meant

for children. Others do not use the bridge because of health challenges and old age.

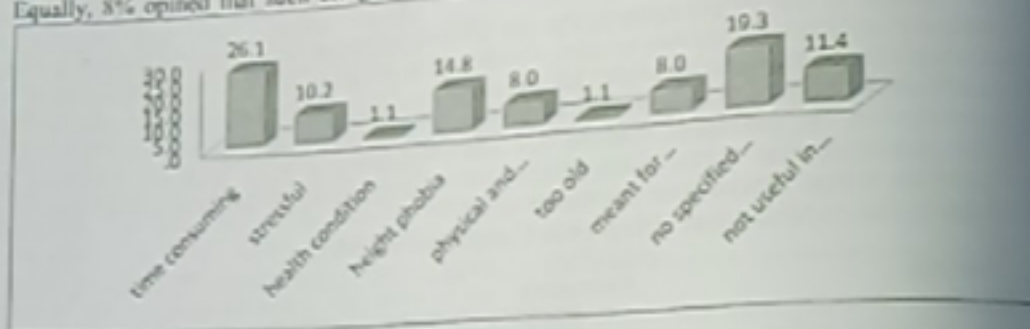


Figure 2: Reasons why people do not use the pedestrian bridge in Minna

4. CONCLUSION

Pedestrian bridges are grossly under-utilized in Minna as about 39% of the populations actually use the pedestrian bridges. This implies low level of compliance as a result of the reasons discussed earlier. To improve the level of compliance in the use of pedestrian bridges in Minna, the study recommends the construction of barricades on road shoulders where pedestrian bridges are located. This will prevent pedestrian crossing on the roads without using the bridges. Barricades could be in the form of hedges, steep concrete road shoulder and the lakes. Setting up signposts close to pedestrian bridges that will direct pedestrians to use the bridges provided. The renovation and upgrading of the old pedestrian bridges at least to the standard of the recently constructed ones in Minna. Deployment of enforcement agents that will ensure and monitor the compliance in the use of pedestrian bridges and prosecute as such. Above all, public enlightenment on the importance of pedestrian bridge should be done.

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