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NIGERIAN ARMY COLLEGE OF ENVIRONMENTAL SCIENCE AND TECHNOLOGY

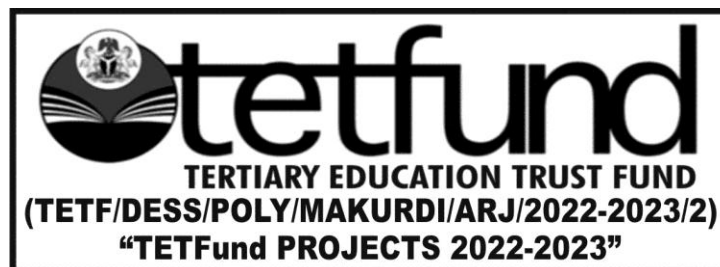
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PREVALENCE OF MALARIA AND SCHISTOSOMIASIS AMONG SCHOOL-AGE CHILDREN IN MAKURDI, BENUE STATE, NIGERIA

ILIYASU, IM^{1*}, SOW, GJ², AFOLABI, OJ³ ABDULLAHI, SA¹ DAHIRU S⁴ AND BALOGUN, JB⁵

¹Department of Science Laboratory Technology, School of Natural and Applied Sciences, Nigerian Army College of Environmental Science and Technology (NACEST) Makurdi, Benue State, Nigeria

²Department of Zoology, Faculty of Life Sciences, Ahmadu Bello University Zaria, Nigeria

³Parasitology and Public Health Unit, Department of Biology, Federal University of Technology Akure, Nigeria

⁴Department of Veterinary Pharmacology and Toxicology, Ahmadu Bello University Zaria, Nigeria

⁵Department of Biological Sciences, Faculty of Science, Federal University Dutse, Jigawa State-Nigeria

*Corresponding author email: ishaqailiyasu77@gmail.com, +2348060382424

Abstract

This research was conducted to determine the “prevalence” of Malaria and Schistosomiasis infections among “school-aged” children in Makurdi, Benue State, Nigeria. Blood, urine and stool samples were collected from 340 school-aged in riverine communities in Makurdi Benue State, Nigeria. The samples were examined for the presence of Plasmodium and Schistosoma species using standard protocols. The results showed that the prevalence of malaria was highest (55%) among the pupils in CAC primary school and lowest (30%) in both Nomadic and LGEA primary schools. Also, highest prevalence (70%) of urinary schistosomiasis was observed in Holy Ghost Primary School and lowest (10%) in both LGEA and Al-Hasan Primary Schools. Intestinal schistosomiasis was noted to be highest (25%) in Holy Ghost Primary School and lowest (5%) in Nomadic, LGEA and Al-Hasan Primary Schools. The results further showed that highest prevalence (55%) of malaria was observed among the students in Government Girls College and lowest (30%) in Forward Ever Academy, Salim Progressive Secondary School and Salam Academy. Urinary schistosomiasis has the highest prevalence (45%) in Al-Burham International Academy and Government Girls College. However, lowest infection (10%) was observed in Salam Academy. In contrast, intestinal schistosomiasis ranged from 5 to 15% among the secondary school students. The study recommends that continuous followed up treatment and distribution of insecticide treated nets should be carried out on regular basis to curtail the menace caused by these parasites. It is therefore recommended that public health awareness and routine investigation should be intensified within the study population.

Keywords: Malaria co-infection, Makurdi, Benue State, Nigeria, School-aged children, Schistosomiasis.

INTRODUCTION

Background of the study

Malaria and schistosomiasis are among the most important diseases of enormous public health burdens in tropical and subtropical countries of the globe (Doumbo *et al.*, 2014). Malaria is a complex and life-threatening parasitic disease caused by the protozoan parasite of the genus *Plasmodium* (Getie *et al.*, 2015). Malaria is associated with anaemia, which causes severe morbidity and mortality in vulnerable groups infected with *Plasmodium falciparum* (Ajakaye and Ibukunoluwa, 2020). Other species that affect humans include: *P. vivax*, *P. ovale*, and *P. malariae*. Schistosomiasis is a chronic and debilitating disease caused by flukes (digenetic

Trematode flatworms) known as *Schistosomes* (Okpala *et al.*, 2004).

Schistosomiasis also known as (biharziasis or snail fever) ranking second to only malaria in terms of its socio-economic and public health importance in tropical and subtropical areas (Ogbe, 2002). It is also the most prevalent of the waterborne diseases and one of the greatest risks to health in rural areas of developing countries (Ofoezie *et al.*, 1998; Ogbe, 2002). An analysis, based on African studies, showed that there is a risk ratio of 2.4 and 2.6 for urinary schistosomiasis (caused by *S. hematobium*) and intestinal schistosomiasis (caused by *S. mansoni*), respectively, among persons living adjacent to reservoirs. The analyses also showed that persons living

near land that had been irrigated for agricultural use had an estimated risk ratio of 1.1 for urinary schistosomiasis and an estimated risk ratio of 4.7 for intestinal schistosomiasis (Steinmann *et al.*, 2006).

Infection occurs through contact with water infested with the free-swimming larval stages of parasitic worms (cercariae) that penetrate the skin and develop in the human body to maturity. Parasite eggs leave the human body with urine or excreta. They hatch in freshwater and infect the appropriate aquatic snail intermediate hosts. *Bulinus* snails are intermediate host for *S. haematobium* (Okoli and Iwuala, 2004). Within the snails they develop into cercariae, which are, in turn, released into the water to infect new human hosts. Transmission can take place in almost any type of habitat from large lakes or rivers to small seasonal ponds or streams (WHO, 2001; Akue *et al.*, 2011). In urinary Schistosomiasis, the worms live in the blood vessels of the bladder. Only about a half of the eggs are excreted in the urine. The rest stay in the body, damaging other vital organs. It is the eggs and not the worm itself which cause damage to the intestines, the bladder and other organs (Brooker *et al.*, 2007).

Schistosomiasis appears to be a neglected tropical disease, but owing to irrigation programs and hydroelectric power development, the incidence of infections is increasing in endemic areas of Africa and the near east, and the risk of infection is highest amongst those who lived near lakes or rivers (Kabatercine *et al.*, 2004; Brooker *et al.*, 2007). More than 207 million people are infected worldwide, with 75% of them living in Africa alone (WHO, 2011). Recent estimates from sub-Saharan Africa have indicated that approximately 280,000 deaths each year can be attributed to schistosomiasis (Van der Werf *et al.*, 2003). In Nigeria *S. haematobium* infection is widespread, constituting a public health problem particularly in children (Sulyman *et al.*, 2009; Doumbo *et al.*, 2014; Griffiths *et al.*, 2011). Although there is no current estimate of the disease in the country, past estimates have put the infection at about 25 million people, and 101 million at risk of infection (Chitsulo *et al.*, 2000). The distribution of the disease is focal, aggregated and usually related to water resources and development schemes such as irrigation projects, rice/fish farming and dams. It occurs in all the states of the federation, with a high infection rate among school children (Mafe *et al.*, 2005; Okpala *et al.*, 2004; Akue *et al.*, 2011).

In Nigeria, Schistosomiasis due to *S. haematobium* is widespread, constituting a public health problem particularly in children (Sulyman *et al.*, 2009; Okpala *et al.*, 2004 and Griffiths *et al.*, 2011). The distribution of the disease is focal, aggregated and usually related to water resources and development schemes such as irrigation projects, rice/fish farming and dams. It occurs in all the states of the federation, with a high infection rate among school children (Mafe *et al.*, 2000; Okpala *et al.*, 2004). There are reports of Bilharziasis in Benue State (Amali, 1989; Atu and Galadima, 2003; Houmsou, *et al.*, 2012). Four species of *Schistosomes* are responsible for human schistosomiasis: *Schistosoma mansoni*, *S. haematobium*, *S. japonicum* and *S. intercalatum* (Swai *et al.*, 2006; Dawaki *et al.*, 2015; Dawaki *et al.*, 2016).

Infection with multiple Species of parasites is often the norm in developing countries (Griffiths *et al.*, 2011). Malaria and schistosomiasis are highly endemic in tropical and sub-tropical areas and their epidemiologic co-existence is frequently observed (Adegnika and Kremsner, 2012; Anchang-Kimbi *et al.*, 2017). The prevalence of malaria-schistosomiasis co-infection reported to be 15 % and caused high prevalence of anemia, as compared to those infected only with malaria (Degarege *et al.*, 2012). Schistosomiasis plays an antagonistic role against malaria, but the egg intensity of *Schistosoma* species and the age of infected individuals could determine the type of interaction (Briand *et al.*, 2005; Sangweme *et al.*, 2010). Although most studies were conducted, reported that *Schistosoma* co-infection contributes to severe malaria presentation. *Schistosoma* co-infection resulted in high *Plasmodium parasitemia* and increased susceptibility of infection to mortality (Yoshida *et al.*, 2000; Sangweme *et al.*, 2009; Legesse *et al.*, 2004; Laranjeiras *et al.*, 2008). In contrast, others illustrated that *Schistosoma* co-infection contributed to low *Plasmodium parasitemia* and inhibited cerebral malaria (Lwin *et al.*, 1982; Wakinine-Grinberg *et al.*, 2010; Bucher *et al.*, 2011).

Both Malaria and schistosomiasis are endemic in Nigeria (Terer *et al.*, 2013). Malaria environmental risk factors include: low utilization of nets, low utilization of indoor residual spray, and availability of multiple mosquitoes breeding site or stagnant water near the home and staying

outdoor overnight. Schistosomiasis risk factors are: lack of access to safe water, contact/exposure to fresh water bodies, outdoor activities, low Socio-economic status,

Materials and Methods

Study Area

Makurdi, Benue State's capital, is situated at latitude $7.732152^{\circ} 41^{\circ}$ N and longitude $8.539144^{\circ} 28^{\circ}$ E (Fig. 1). The Benue River runs through Makurdi, and the city's primary settlements are around 671 meters long (Udo, 1981). The rainy season lasts seven months (April to October), with an annual rainfall of 120-200cm on average (Akaahan *et al.*, 2010). Peak flows occur from August to early October, while low levels occur from

and poor educational access for schistosomiasis (FMOH, 2007; Getie *et al.*, 2015).

December to April, depending on the rainy season. Intensive agricultural activity, bathing, swimming, and washing in rivers and streams are all common during this time (Houmsou *et al.*, 2012). Throughout the year, the area has high temperatures ranging from $28-33^{\circ}\text{C}$, with the months of March and April being the hottest. During the months of December and January, Harmattan winds are accompanied by cooling effects (Nyagba, 1995).

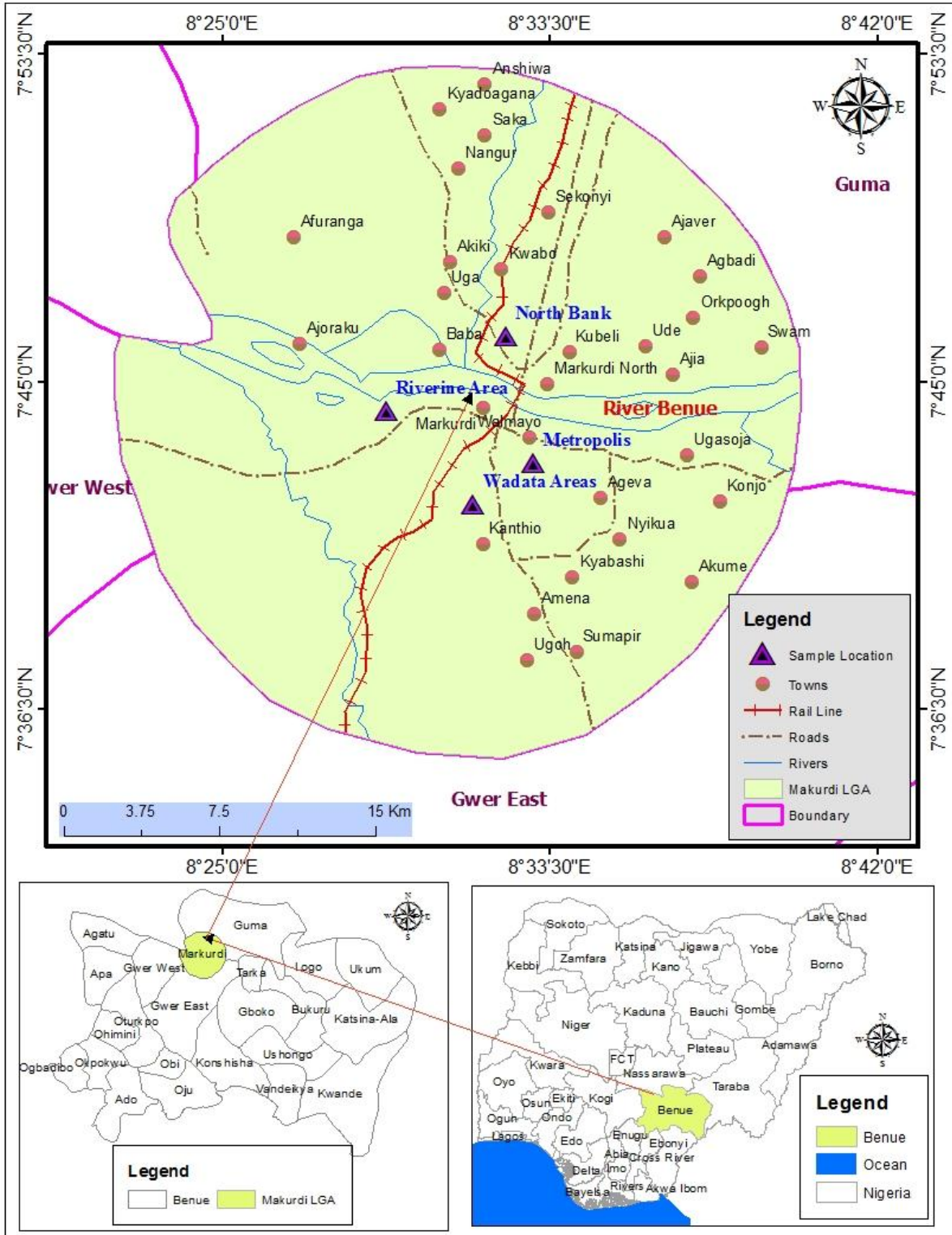


Figure 1: Map of Makurdi, Benue State.

Source: Modified from Administrative Map of Benue State.

Sample Size Determination

The sample size (n) was estimated using modification formula ($n = Z^2 (1-p)/L^2$) Kogi, (2015)

$$N = \frac{Z^2 (1-p)}{2L^2}$$

Where:

Ethical Considerations

Before the commencement of the study, ethical approval was obtained from Benue State Ministry of Health with the reference number MOH/STA/204/VOL.1/124, Federal Medical Centre with the reference number

Study Period

The study was conducted for a period of nine (9) months, from June, 2020 to February, 2021. The months

Study Design

Random sampling was used in selecting participants from each school and the riverine communities.

Inclusion Criteria

Primary 1-3 and 4-6 pupils of age range 6–9 and 10-13 years respectively, secondary school students of age range 14-17 and 18-21 years respectively were recruited. And 1-10, 11-20,

Data Collection and Questionnaire Administration

The data was gathered from the respondents using a structured questionnaire. Socio-demographic data such as age, sex, parent's occupation (for school-aged children and children from riverine communities), water source and water contact activities, method of water treatment, housing distance from water body, outdoor activities, and other variables were all asked. With the

Sample Collection and Laboratory Analysis of Samples

One thousand and sixty (1,060) blood, urine and stool samples were collected from each of the 1,060 individuals. The samples were collected in clean, wide mouth, screw capped and dry transparent containers for stool, sterile urine sampling bottles for urine, and

n = is the sample size required.

Z = the normal distribution at 95% confidence interval.

P = Proportion of infected individuals on a scale of 1.

q = Proportion of infection free individuals on a scale of 1.

L = Precision level or allowable error on a scale of 1.

FMH/FMC/MED.108/VOL.1/X and permission was sought from Makurdi Local Government Education Authority, Riverine Communities Head, and Parents of children.

are characterized by rainy season from June to October and harmattan/dry season normally prevail from the month of November to February.

Study Population

Seventeen (17) schools and three (3) riverine communities were randomly selected based on proximity to source of water.

21-30 and 31-40 years age groups from the riverine communities were also recruited. The anonymity of each pupil was treated with high level of confidentiality as the purpose of this research is concerned.

help of health educator workers, community-based research assistants, and teachers, some of the questions were translated and delivered to them in their native language for better understanding. The students were grouped into their respective classes and directed to appropriately fill the form and riverine communities were also grouped at their respective working places, as adopted by Kapito-Tembo *et al.* (2009).

anticoagulant blood sampling bottles (EDTA bottles) for blood samples (Cheesbrough, 2006; Mu'azu, 2008). Collection was done between the hours of 07am – 10am and samples were transported to the laboratory, Federal Medical Centre Makurdi for analysis according to the method of Cheesbrough (2005).

Microscopic Assessment of *Plasmodium* species

Two drops of venous blood was placed separately on a microscopic glass slide as adopted by WHO (1991) and Nyarko *et al.* (2018) Thick and thin blood films were prepared and air dried. Thin blood films were fixed with absolute methanol and both films were stained with 10% Giemsa stain for 10 minutes. Both thin and thick blood films were examined using light-camera microscope (LEICA DM 2500 model) with a $\times 100$ objective lens for the presence of malaria parasite. The density of the parasite was counted as “Number Parasites Found” (NPF) using recommendations of WHO standard, the parasitized RBCs are counted against leukocytes (WBCs) in the

Analyses of Urine Samples for Schistosomiasis Detection

For haematuria examination, chemical reagent strip methods as described by (Cheesbrough, 2002; WHO, 2011) were employed. Reagent strip combi-9 and combi-10 (Medi-Test Macherey-Nagel, Germany) was dipped into each urine sample and the color was matched with the standard color by the side of the container as recommended by the manufacturer to determine the presence of blood in urine. Urine samples were examined to detect the presence of eggs using sedimentation technique. Each urine sample was thoroughly shaken and 10ml decanted into a test-tube and centrifuged at 3,000 rpm for 5 minutes in haematocrit centrifuge machine and the supernatant was discarded leaving the sediments. A drop of the sediment was placed on a clean microscope

Analyses of Stool Samples for Schistosomiasis

Using the standard Kato-Katz technique adopted by WHO, 1991; WHO, 2011; Solomon *et al.* (2013), Rasoamanamihaja *et al.* (2016) and Feleke *et al.* (2017), about 1–2 mg of the stool sample was emulsified in a drop of normal saline (0.85 % NaCl) on the center of the slide using a disinfected stick. A cover-slip was placed on the sample and was examined systematically with $\times 10$ and $\times 40$ objective lenses. A disinfected stick was used to emulsify an estimated 1g (pea-size) of representative faeces in about 4 ml of 10% formol water contained in a screw-cap tube. Then further 3–4 ml of 10% w/v formol water was added and mixed well by shaking. The emulsified faeces were sieved using gauze and the suspension was transferred to a centrifuge tube. Then 3–4 ml of diethyl ether was added. The tube was capped and mixed for 1 min, and immediately centrifuged at 3,000

rpm, the number of leukocytes (WBCs) used is 8,000 (WHO, 1991). In addition, two tally counters (one to count parasites and the other to count leukocytes, and a simple electronic calculator) was used and expressed by this formula.

$$\text{Parasites per microliter} = \frac{\text{Number of parasites counted}}{\text{Number of leukocytes (WBCs)}} \times 8000$$

The infected individuals were treated with Artemisinin combination based therapy (ACT), anti-malarial drugs which are used for the treatment of malaria.

slide and stained using Lugol’s iodine and left for 15 seconds for the stain to penetrate the eggs and viewed under microscope at low power ($\times 10$) and then $\times 40$ objective lens (Cheesbrough, 2002; WHO, 2011). The number of *S. haematobium* eggs per 10ml of urine was counted for each positive sample and the result was calculated by multiplying the crude egg numbers per slide with the number of ml of the respective urine sample and dividing by 10 to represent the intensity. Heavy intensity of infection was defined as >50 *S. haematobium* eggs per 10ml (WHO, 1991 and WHO, 2011). Presence of terminal spine indicates *S. haematobium*. The infected individuals were treated with praziquantel, anti schistosomal drugs which are used for the treatment of schistosomiasis.

rpm for 1 minute. After centrifugation, the fecal debris was separated in a layer between the diethyl ether and the 10% formal-saline layers. A faecal debris layer was loosened by disinfected wooden stick and the tube was rapidly inverted to discard the ether, faecal debris, and formol water. The bottom of the tube was tapped to re-suspend and mix with the sediment. Finally, the sediment was transferred to a slide and covered with a cover glass. Then the preparation was examined microscopically using the $\times 10$ and $\times 40$ objective lenses. Presence of lateral spine indicates *S. mansoni*. Procedures developed by WHO (2011) were used to determine the intensity of the *S. mansoni* infection. Two slides per individual stool sample were prepared by filling a Kato-Katz template on 2 separate slides with stool (Kato-Katz kit, Vestergaard-Frandsen, Lausanne, Switzerland), levelling and covering each sample with a cellophane slip pre-stained with

methylene blue (Katz *et al.*, 1972). The stool slides were read within 60 minutes for detection of *Schistosoma mansoni*, eggs. The number of eggs per gram (EPG) of stool was calculated by multiplying the crude egg number per slide by 24 in line with producer instructions (WHO, 2011). Based on egg per gram (EPG) of faecal samples,

Data Analyses:

Descriptive statistics was used to determine the frequency of distribution and percentage prevalence of *Plasmodium* and *Schistosoma* species. Chi-Square was used to test the association of *Plasmodium* and *Schistosoma* species with demographic and socio-economic factors. Odds ratio was

RESULTS

The result presented in Table 1 is the prevalence of *Plasmodium* and *Schistosoma* species among primary school pupils in Makurdi, Benue State, Nigeria. These results show that *Plasmodium* and *Schistosoma* species were identified from this sampling schools during the period of the study; *P. falciparum* had the highest prevalence 65 (40.6%), followed by *S. haematobium* 47 (29.4%), the least prevalence was *S. mansoni* 19 (11.9%). Species prevalence revealed that highest prevalence 11 (55.0%) of *P. falciparum* was recorded at C.A.C Wadata, while the least prevalence 6 (30.0%) each was recorded at Nomadic Primary School North Bank and LGEA Primary School North Bank. Highest

three classes of severity of the infection were classified as follows: Light: 1 to 99; Moderate: 100 to 399; Heavy: > 400. The infected individuals were treated with praziquantel, anti schistosomal drugs which are used for the treatment of schistosomiasis.

used to test association between risk factors and prevalence of infection. Differences in the mean variables of the *Plasmodium* and *Schistosoma* species were analyzed using t-test and one-way ANOVA. Values were also considered to be significant at $P < 0.05$.

prevalence 14 (70.0%) of *S. haematobium* was recorded in Holy Ghost Primary School Makurdi, while the least prevalence 2 (10.0%) each was recorded at Nomadic Primary School North Bank and Al-Ihsan International Academy. Highest prevalence 5 (25.0%) of *S. mansoni* was recorded in Holy Ghost, while the least prevalence 1 (5.0%) each was recorded at Nomadic Primary School North Bank, LGEA Primary School North Bank and Al-Ihsan International Academy Makurdi. There was no Statistically Significant difference ($P > 0.05$) in Prevalence of *P. falciparum* and *S. haematobium*, there is Statistically Significant difference ($P < 0.05$) in Prevalence of *S. mansoni* in the different primary schools.

Table 1: Prevalence of *Plasmodium* and *Schistosoma* Species among Primary School Pupils in Makurdi, Benue State, Nigeria

Schools	Number examined	<i>Plasmodium falciparum</i>		<i>Schistosoma haematobium</i>		<i>Schistosoma mansoni</i>	
		Infected	Prevalence (%)	Infected	Prevalence (%)	Infected	Prevalence (%)
CAC Wad Prim. Sch.	20	11	55.0	6	30.0	3	15.0
Holy Ghost Prim. Sch.	20	9	45.0	14	70.0	5	25.0
LGEA ghr Prim. Sch.	20	10	50.0	9	45.0	3	15.0
Arabic ghr prim. Sch.	20	7	35.0	7	35.0	3	15.0
Root Succ Prim. Sch.	20	8	40.0	3	15.0	2	10.0
Nomadic N prim.Sch.	20	6	30.0	4	20.0	1	5.0
LGEANB prim. Sch.	20	6	30.0	2	10.0	1	5.0
Al-Ihsan IA Prim.Sch.	20	8	40.0	2	10.0	1	5.0
Total	160	65	40.6	47	29.4	19	11.9
t-test P-value		P = 0.52		P = 0.15		P=0.04	

- ❖ CAC Wad Prim. Sch.: Christ African Church primary school wadata.
- ❖ Holy Ghost Prim. Sch.: Holy Ghost primary school Makurdi.
- ❖ LGEA ghr Prim. Sch.: Local Government Education Authority primary school Makurdi Government house road.
- ❖ Arabic ghr prim. Sch.: Arabic primary school Makurdi Government house road.

- ❖ Root Succ Prim. Sch.: Root of success primary school Makurdi.
- ❖ Nomadic N prim.Sch.: Nomadic primary school north bank.
- ❖ LGEANB prim. Sch.: Local Government Education Authority primary school north bank.
- ❖ Al-Ihsan I Prim. Sch.: Al-ihsan international academy primary school Makurdi.

The result presented in Table 2 is the prevalence of *Plasmodium* and *Schistosoma* species among secondary school students in Makurdi, Benue State, Nigeria. *Plasmodium falciparum* had the highest Prevalence 70 (38.9%), Followed by *S. haematobium* 46 (25.6%), the least Prevalent was *S. mansoni* 18 (10.0%). Species specific prevalence revealed that highest prevalence 11 (55.0%) of *P. falciparum* was recorded at Al-Irshad Model Academy, while the least prevalence 6 (30.0%) each was recorded in students attending 4 schools in the study area. Highest prevalence 9 (45.0%) each of *S.*

haematobium was recorded in Al-Burhan International Academy Wadata and Government College Makurdi, while the least prevalence 2 (10.0%) was recorded at Salam Academy Wadata. Highest prevalence 3 (15.0%) each of *S. mansoni* was recorded in students attending 4 schools in the study area, while the least prevalence 1 (5.0%) each was recorded in students attending 4 schools in the study area also. There was no Statistically Significant difference ($P > 0.05$) in Prevalence of *P. falciparum*, *S. haematobium*, and *S. mansoni* in the different secondary schools.

Table 2: Prevalence of *Plasmodium* and *Schistosoma* Species among Secondary School Students in Makurdi, Benue State, Nigeria

Schools	Number examined	<i>Plasmodium falciparum</i>		<i>Schistosoma haematobium</i>		<i>Schistosoma mansoni</i>	
		Infecte d	Prevalence (%)	Infecte d	Prevalence (%)	Infecte d	Prevalence (%)
Forward E. Acad.	20	6	30.0	3	15.0	1	5.0
Extensive college.	20	10	50.0	4	20.0	1	5.0
Salim progress. S.	20	6	30.0	3	15.0	1	5.0
Al-burhan I Acad.	20	7	35.0	9	45.0	3	15.0
Salam academy	20	6	30.0	2	10.0	1	5.0
Al-Irshad model S	20	11	55.0	6	30.0	3	15.0
Gov't. Girls Coll.	20	10	50.0	9	45.0	3	15.0
Gov't. College.	20	7	35.0	7	35.0	3	15.0
Aliyu jama'a M	20	7	35.0	3	15.0	2	10.0
Total	180	70	38.9	46	25.6	18	10.0
t-test P-value			P = 0.87		P = 0.87		P = 0.08

- ❖ Forward E. Acad.: Forward ever academy wadata.
- ❖ Salim progress. S.: Salim progress school wadata.
- ❖ Al-burhan I Acad.: Al-burhan international academy wadata.
- ❖ Al-irshad model S.: Al-irshad model school Makurdi.

- ❖ Gov't. Girls Coll.: Government Girls College Makurdi.
- ❖ Gov't. College: Government College Makurdi.
- ❖ Aliyu jama'a M.: Aliyu jama'a memorial Arabic College Makurdi.

DISCUSSION

Prevalence of Malaria and Schistosomiasis infection among riverine communities and school-aged children in Makurdi, Benue State, Nigeria was carried out from June, 2020 to February, 2021. Primary school pupils *Plasmodim* species data revealed that CAC Primary Wadata had the highest prevalence of 11 (55.0%) while the lowest prevalence of 6 (30.0%) were recorded at Nomadic Primary School Jankwakwa North Bank and LGEA Community Primary School Unguwan Kabawa respectively. The observed variation recorded for *P. falciparum* infection might be attributed to the use of malaria prevention methods such as insecticide-treated nets and among other insecticides. Similar observation was reported by Mazigo *et al.* (2010).

For *Schistosoma* species, Holy Ghost Primary School Makurdi has the highest prevalence for both *S. haematobium* and *S. mansoni* with 14 (70.0%) and 5

(25.0%) respectively while the lowest prevalence of 3(15.0%) were recorded at CAC primary school Wadata and Arabic Primary School Makurdi. The reduced prevalence in the present findings could be attributed to improvement in sanitation, the supply of safe water, awareness about the disease and the year-to-year administration of praziquantel to the school children in all the selected schools as reported by Houmsou *et al.* (2012) from Buruku and Katsina-Ala local government areas, Benue, Nigeria. Similar observation was reported by Adulugba and Omudu, (2015) and Olayinka *et al.* (2020) in Agatu communities, Benue State and Eggua Community, Ogun State, Nigeria respectively. In the present finding it revealed that Plasmodiasis and schistosomiasis co-infection were endemic in the study sites; however, the endemicity level was moderate as it falls within the range of 10% to 50% recommended by WHO (2020). The prevalence was comparable to

previous findings by Ahmed *et al.* (2015), Omenesa *et al.* (2015) in Bomo, Zaria, Kaduna State and by Adulugba *et al.* (2015) in Agatu communities, Benue State. The overall prevalence of 19% obtained in this study corroborates with that of Damen *et al.* (2006) who recorded 19.0% prevalence among students in a local Government Area of Kaduna State. It was however, lower than that of Duwa *et al.* (2009), Agersew *et al.* (2016) and Alhaji *et al.* (2021) who recorded 52.5 %, 28.8% and 20.4% of *S. haematobium* infections in; 52.5 % in primary school pupils in Minjibir, Jalingo and Bauchi Metropolis.

CONCLUSION

The present research revealed that there is a moderate endemic infection for both *P. falcifarum* and Schistosomiasis with an overall prevalence of 20. The overall prevalence of *Plasmodium falciparum*, *S. haematobium* and *Schistosoma mansoni* among school-aged children in Makurdi, Benue State, Nigeria is 65 (40.63%), 47 (29.38%), and 19 (11.88%) respectively.

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- S. haematobium* infection rate revealed that Arabic Primary School Makurdi and CAC Primary School Wadata had a higher value of 7(35.0%) and 6 (30.0%) respectively while L.G.E.A Community Primary School Unguwan kabawa North Bank and Al-ihsan International Academy Makurdi had lowest prevalence of 2 (10.0%). The highest prevalence could be due to the proximity of the area to water bodies as reported by Solomon *et al.* (2012) in their finding on *P. falciparum* and *S. mansoni* co-infection and the side benefit of artemether-lumefantrine in malaria patients.
- Based on the findings from the study, it is recommended that: The infected participants that were treated with anti-malarial drugs for malaria and praziquantel for schistosomiasis should be monitored. Continuous followed up treatment should be carried out frequently by health authorities to prevent re-infection. Control intervention should also be done by authorities and routine investigation should be carried out often.
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A LEXICOGRAPHY STUDY OF INFORMAL USAGE OF ENGLISH LANGUAGE IN THE NIGERIAN ARMY

JA'AFARU, UMAR IDRIS

Department of Languages Nigerian Army College of Environmental Science And Technology Makurdi

Phone: 08038259421

email: jaafaruumaridris@gmail.com

Abstract

Lexicography as a feature of language use is common to all language users. The role it plays is consequential in the military linguistic domain. However, the military exploit extensively the use of lexical items to establish variety in the usage of language. The use of language in an informal expression within the military had again encapsulated another linguistic domain of language use predominated with distinct features common to the military. The primary aim is to achieve linguistic identity in the military speech environment. The possible implication is that these sets of lexical items used within the military constitute a semantic shift in meaning. That is to say meaning in contexts is far from the literal meaning and some new lexical items are formed from the combination of English and local Nigerian languages; while others are purely English and Local languages. Though from the analysis of the selected lexical items used within the military, it can be inferred that the military domesticated the language to suit their communication purpose. The military had extended its linguistic competence in invention of words made up of English and indigenous languages such as: "wawarization", "wawaparade", "buykarara": others are purely English and local languages: English: "bagger lizard". "banger banger", "cut five", Local languages: "janjami", "samaqwe", "kelebe" etc. have different contextual meanings as it is used within the military linguistic environment.

Keywords: *Lexicography, Informal.*

INTRODUCTION

This research entitled "Lexicography study of Informal usage of English in the Nigerian Army" sets out to investigate the informal use of English in the non-formal sector of language use in the Nigerian Army. This research will look at such informal forms of language use with the intention of doing a lexicographic interpretation of the terms and expressions used in the informal context in the military.

The military environment is entirely a different community with its own linguistic repertoire. However, new words are emerging in this linguistic community from within the official military registers and local languages and such language forms are springing widely in the Military Barracks. As such, the researcher deems it fit cause to investigate the existence of these military, and the Nigerian Army remains the focal point of investigation and data sourcing. Relative to other professions across the world, the Nigerian Military is an institution that is constituted with its terminologies and registers domiciled for its day to day operations (mostly formal usages).

Considering the distinctiveness of the Nigerian Military and the regimented professional and social life within the military, it is a veritable domain of discourse. More often than not, informal usage of English invariably subsumes the speech context and situation manner of expression in relation to the contextual variables to the military settings. This style is characterized by the lexical items predominantly generated from the official military registers and major local languages of the country; performing a function of an informal language which is popularly called "slang", a variety of linguistic domain. This phenomenon is commonly practiced amongst officers and men of the Nigerian Military in their leisure communicative environment. At times, the situation unconsciously occurs in a formal settings but negligible. This study will contribute to the body of knowledge that informs the need for making choices from the words of language where the speaker or the writer takes into consideration the context in which he or she is speaking or writing. Context as a matter of necessity is the situation in which the speech or writing is being made. This is evident in the work of J.L. Austin (1962), where

he defines the concept as the situation which yields the sense intended by the speaker. By extension, the choice of vocabularies in use in the Nigerian Military was necessitated by the context of communication that resulted to informal expression popularly known as slang language.

It is against this backdrop that the researcher intends to carry out a study to know the contribution of lexical items used in the military in conveying the meaning effectively without ambiguity in the informal context.

Statement to the Problem

Over time, understanding military language use has been of great interest to linguists. The variance in language usage has distinguished the military linguistic community as an entity. As a sociolinguistics community that develop its style of language usage to suit its communicative repertoire and environment, the military has since been using informal forms of language to communicate with colleagues in a friendly contexts.

Area of the Study

This research is a study of lexical items as used in informal context in the Nigerian Army. The study is restricted to unofficial registers and the analysis is on lexical words. The usages are categorized such thus:

Objective of the study

This research has its main objective, the investigation of the lexical usage in the Nigerian Army in an informal setting. The specific objectives of the research are as follows:

Research Questions

1. How are meanings of words construed in relation to the military domain of usage?

Justification of Research

The researcher is interested in the area of study because it has been a linguistic observation that language can be used to perform different social functions; and in all of these, context plays a very significant role in interpreting the meaning of a word. Context, to a greater extent determines the formal or informal use of a word. Understanding the concept of language and context has been a concern of many linguists among which are; J. Firth and M.A.K. Halliday (1935), Wittgenstein (1953),

And again to analyse meaning implications of the lexical items used in this context. Nevertheless, the aim of making such choices of lexical items is to ensure communicative restriction, which can be term as a style in the military linguistic speech community. This informal usage places the user at liberty to make choices of words of language to suit their purposes of communication.

This phenomenon, however is spreading widely in the barracks, indeed, gaining reception as a variety of language springing for specific purposes. This form of expressions is determined by the choices of lexical items within the context of military speech community. This trend of language usage in the military informs the researcher to investigate the Nigerian Military usage of English in an informal context

1. Contextual Meaning.
2. Literal Meaning.
3. Root.

1. To investigate the meaning of the words in relation to the military domain of usage.
2. To analyse the meaning of lexical items and their implications in the military life style.
3. To establish the communicative functions of the informal forms of English usage in the military.

2. What are the meaning forms of lexical items and their implication in military life style?
3. What communicative functions does this informal form of English perform in the military?

Clark (1978), Brown and Yule (1983: 139-40). It must be pointed out however that their focus did not include contextual use of language among the Nigerian Military. This work seeks to help investigate the informal use of English in the Nigerian Military, most especially within the Nigerian context. It adds ideas to existing literature on language and context. The research, a part from being a guide to other researchers in field, will be useful to the society, especially as the language variation is inalienable aspect of the society. It serves as knowledge for students

as well as reference material for further study in the area

Definition of Terms

1. Lexicography: Hartman and James (1998) defines lexicography as; the professional activity and academic field concerned with dictionaries and references. It has two basic divisions: lexicographic practice, or dictionaries making and lexicographic theory, or dictionaries research.

Methodology and Data Collection

This is a data-based research, the data for this research are items of language use (sample) within the Nigerian Army Barracks (Nigerian Defence Academy Kaduna, Nigerian Army Depot, Zaria, Nigerian Military School Zaria, Nigerian Army Cantonment Ikeja, Nigerian Army Cantonment Ojo Lagos, Akin Barracks Calabar and Sobi Barracks Ilorin). The items obtained are informal lexical items used in the military circles within the barracks. The primary of sources of this data will be the Nigerian Army Barracks Participants observation methods are used for the research. The Nigerian Army Personnel are the main sources of information and data collection.

Theoretical Framework

This research will be situated around Firthian usage theory of meaning (1957), we consider this theory to be more adequate for the research because the theory deals with meaning in relation to context of situation, where meaning of word and sentences are related in two ways:

a. External words; which is also known as context of situation.

The Usage Meaning or Contextual Meaning

Firth's ideas are fundamental to his conception of language, as he considered the analysis of the meaning of utterances to be the main goal of linguistics. This was unusual at a time when contemporaries such as Bloomfield were positively excluding meaning from linguistic study. Firth rejects any kind of distinction between 'langue' and 'parole' (as Saussure made before Firth) or 'competence' and 'performance' (as Chomsky did after him), because, for Firth language was not an autonomous entity, and was not to be studied as a mental system. Rather, in keeping with the behaviorist and positivist ideas of the contemporary intellectual environment (the work of Skinner, for example).

Firth saw language as a set of events which speakers uttered, a mode of action, a way of 'doing things', and

of informal usage of language.

2. Informal Language: Informal language is that which is suitable for ordinary conversation or letters to friends, more used in everyday speech than in writing. It often violates the convention of "standard" language. Zapata (B-2008).

This study adopts the random sampling approach for data collection. This is as a result of the need to establish and administer variables in organizational speech community. Most especially informal sociolinguistic setting that brings closely the speaker and the respondent in an interactive face. Firthian Theory of meaning (1957) that looks in to meaning from the external words and network of situation was used. Firthian method of theory application in contexts is fervent to this research. Indeed the main sources of information and data remain the Nigerian Army personnel in the military barracks.

b. Network of situation; is the linguistic structure, sound, morphemes, graphonemes, lexes etc.

By this, it means the external word and context of situation deals with speaker and the hearer, and the role of their relationship and situation.

therefore linguists should focus on speech events themselves. This rejected the common view that speech acts are only interesting for linguists to gain access to the 'true' object of study – their underlying grammatical systems. As utterances occur in real-life contexts. Firth argued that their meaning derived just as much from the particular situation in which they occurred as from the string of sounds uttered. This integrationist idea, which mixes language with the objects physically present during a conversation to ascertain the meaning involved, is known as Firth's contextual theory of meaning' or his theory of 'context of situation', a phrase which he borrowed from Malinowski. Some of Firth's ideas on meaning were developed in his misleadingly titled article *The Technique of Semantics* (1935).

Data Presentation and Analysis

Data presentation and analysis. For this the corpus materials are presented based on Firth (1957) dichotomy of denotative and meaning in contexts. However, at the root formation level different words formation and its origin are considered for balance interpretation of the

data. The study begins with the identification of military terms used in an informal context and its meanings at different levels. And at the analysis stage, different functions of words are pointed out at different levels of meanings.

Data Presentation

S/N	Military Terms	Literal Meaning	Contextual Meaning	Root
1	All the way	[All] the whole of/ [The] definite article/[Way] method for doing something	Esprit de corps or we are together	English
2	Bagger Lizard	[Bagger] An extremely ugly woman/[Lizard] a small animal with a long tail and rough skin (a type of Reptile)	Insulting word for one who is stupid and useless	English
3	Bang	To hit something hard	To lock a soldier in the guard room or an officers locked in the mess	English
4	Banger banger	All old car in bad condition	Doing things disorderly	English
5	Barracks Riffle	Group of buildings where members of Armed Forces live and work/to hit a ball hard so that it move on a straight line	A lady living in the barracks	English
6	Blanket Putty	[Blanket] to cover something with a layer of something/[Putty] perusal by somebody	To serve a general punishment	English
7	Bulldoze	To clear an area by removing earth stone	To have your way through	English
8	Buy job	[buy] to get something by paying money/[job] work to earn	Look for trouble	English
9	Buy karara	[buy] to get something by paying money	Find problem for oneself	English/Hausa
10	Calandrous	-	Someone who is aged	English
11	Cassevac	Medical rescue	To drop a lady who visit or slept over in her boyfriend's house	English
12	Clown	Someone who often make people laugh	A cadet on training	English
13	Cut five	[cut] to use a knife or sharp tool to divide something into two/[five] is a number (5)	To sleep for a short period of time during the day or nap	English

14	Deploy	If a government or Army deploy a soldier	To bring a lady home	English
15	Fatigue	Feeling of extremely tired either physically or mentally	A manual labour	English
16	Gbangbacious	-	Someone who has weight and giant	Yoruba/English
17	Gboye	-	Garri	Igbo
18	Can we	[can] to know how to/[we] use for referring to yourself and one or more other people when you are the person speaking	Ratio (food)	English
19	In-spring	To release a trigger	To have sex	English
20	Janjami	-	To take a written relevant material into examination hall for a guide	Hausa
21	Kelebe	-	Personnel carrying out illegal duty	Yoruba
22	Kparuf	-	To mal handle someone	Yoruba
23	Kuskus	-	A derogative word for someone considered to be insignificant (officer cadet on training)	Hausa
24	Laushi	-	Someone who doesn't like to work	Hausa
25	manoeuvre	Planned to move by military group involving many soldiers	To disappear tactically	English
26	Maate	-	To run away	Hausa
27	Massage	Action of pressing, squeezing and rubbing someone's body	To deal with someone or offender	English
28	Mugabe	-	To be rigid	Zimbabwe
29	My parade	[my] use for showing something that belong to you /[parade] a public celebration which large group of soldiers match together	To be under ones command or a woman whose belong to someone	English
30	Naka	-	To detail one on extra duty	Hausa
31	Open dash	[open] an area not covered/[dash] to run	To run away	English
32	OC malinge	[OC] officer – in-charge/[malinge] one who pretend to be ill	One who is not willing to work often	English
33	Packerdity	-	To dress smartly in uniform	English
34	Panel beat	[panel] to cover a space with flat piece of wood or	To hit someone or an offender	English

		metal/[beat] to hit several times		
35	Patch	A piece of cloth that you saw over a hall	Eye service or to do something to impress superior	English
36	Roger	Use for saying that you have received and understood Radio message	To give money inform of gift, appreciation or bribe	English
37	Samaqwe	-	A lady	Hausa/Tiv
38	Shara	-	Commercial sex workers	Hausa
39	Sha ruwa	-	Take it easy	Hausa
40	Shuwa	-	To summersault someone in a mould	Hausa
41	See Distribution	[see] to observe by personal experience/[distribution] a state of giving something to a group of people	Lists of dependants to send money to by end of the month	English
42	Silent drill	[silent] free from sound/[drill] a way of teaching people something by making repeat it several times	To do something secretly	English
43	Titi kaka	-	To party	Onomatopoeie
44	To work on	[to] use as a part of infinity/[work] to spend time producing or improving something/[on] touching and supported by the top surface of something	To discipline someone who is misbehaving	English
45	Wala	-	To take a written relevant material into examination hall to guide	Hausa
46	Wawa Order	[order] to tell someone to do something	Unserious directive	Hausa/English
47	Wawa parade	[parade] a public celebration in which large group of soldiers match together	Unserious task	Hausa/English
48	Wawarization	-	Something useless, meaningless or not serious	Hausa/English
49	Welfare	Care provided by the state or another organization for people in need	A momentary gift	English
50	Zero it	[zero] informal nothing at all or the number (0)/[it] the third person singular personal pronoun used to referred to an inanimate object	To give up	English

Table 1: The Levels of Meanings

Data Analysis

The data collected as rightly demonstrated above are analysed here based on the following three parameters:

Analysis of Literal Meaning

The distribution of the data at this level shows that most of the words have dictionary meanings while some others do not. But then, those without any dictionary meaning are purely local words. Looking at these words, we will see that some of them ordinarily will not be regarded as a word in English, rather as a “phrase”. Words like:

- i. Open dash

Analysis of Contextual Meaning

The presentation of meaning here reveals a great deal of semantic shift in meaning of the words from what it used to be, that is the literal or dictionary meaning-to the meaning obtainable within the context of use. It was observed here that the distributions of words are in two categories:

- i. Those that appear in form of a phrase yet are considered a word in the military. e.g.
 - a. All the way
 - b. Buy job
 - c. Bagger lizard
 - d. Barrack riffle
 - e. Buy karara
 - f. Cut five

Considering the above listed examples, they all will be regarded as phrases in English Language; meanwhile, the reverse is the case when apply in the military context where they are employed as individual words with distinct meanings (c.f. table 1). It then goes to show that, though some of these words are English based but because of the influence of the context on them, they all have a different meaning relative to the ethics of the profession, in other words, they become a kind of register commonly found in the military.

- ii. Those that are purely one word

The second sets of words are those employed as a single word in both its original (denotative) form and the

the literal meaning, the contextual meaning and the root level. This will now be explained in details here.

- ii. OC malingering
- iii. All the way
- iv. To work on
- v. Panel beat

Will definitely be regarded as phrases; which is the more reason, the meaning of each word was presented in the data. Meanwhile, words like: *welfare*, *roger*, *patch*, *massage*, etc. have distinct entries in the dictionary.

contextual form. Although they seem to maintain some levels of correlation in terms of their forms, they non-the-less differ in meaning. Examples of these as provided in the data are:

- i. Roger
- ii. Bang
- iii. Clown
- iv. Deploy
- v. Fatigue
- vi. Patch

All the above words are monosyllabic English words with their varied dictionary meanings as presented in the data but which have been subjected to different meanings in the military context.

- iii. Those that are purely local

However, it must be stated at this point that while some of these words are English-based, as few others are purely local invention made up of the different indigenous languages. Such a word include: “gboye”, “laushi”, “mugabe”, “mate”, “naka”, “kuskus”, etc. The meaning of these words, even though they are local words, have been subjected to the contextual use just like every other words thereby creating semantic shift from what it used to in the general local usage. The communicative implication of contextualizing words in this manner is that it allows the military personnel to maintain group identity within their speech domain.

Analysis of the Root Level

The root level present a complex formation of words. In this regards, it was observed that some of the words are purely English-based, others have process that involve the blending of English and local usage. The marriage of these two words (English and local languages) have

resulted in a different variety, which could be regarded in a way as the military variety of usage. For instance, of the 50 selected words, 28 are purely English based and 7 are purely the admixture of the two, while 15 are purely local ‘concoction’. Examples are presented in the table below:

S/N	English-Based Words	Admixture of Eng. & Local Lang.	Purely Local
1	Clown	Wawarization	Titi kaka
2	Fatigue	Gbangbacious	Samaqwe
3	Deploy	Wawa parade	Luashi
4	Bang	Wawa order	Sha ruwa
5	Roger	Buy karara	shara

Table 2: Root Table

Needed to be mentioned here is the uniqueness of the level two on the table above (i.e. the admixture of English and the local variety). It is unique in the sense that it reveals the stylistic use of language most especially as it concerns its formation in terms of having what could be regarded as a complex root formation. E.g.

- i. Buy + karara = Buykarara
- ii. Gbagba + cious = Gbagbacious
- iii. Wawa + order = Wawaorder
- iv. Wawari + zation = wawarization
- v. Wawa + parade = Wawaparade
- vi. Titi + kaka = Titikaka
- vii. Sama + qwe = Samaqwe

Considering the distribution of the data. It was observed that the majority of the words have their origin in English, some have theirs in the Nigerian local/indigenous languages and some others are generated from sounds. For example, 30 of the words have English origin, 17 have local origin, 2 have a mixed origin, and 1 have its in sound. What we can infer from this is that these informal terms have multiple origins, that is, they are not confined to the local context alone

Findings

At the onset of this research the researcher has as his objectives; (i) the investigation of the meaning of certain words in relation to the military domain of usage; (ii) the analysis of the meaning of lexical items and their implications in the military life style; (iii) and lastly, the communicative functions these terms especially in the informal usage.

In view of the analysis above, the researcher found out that some of these words, used in informal settings, have meaning implications totally different from the once obtainable outside the military domain. Besides, it was also discovered that some of these words are English-based, while others are generated from the day-to-day use of local languages cutting across the major languages in the country vis-à-vis: Hausa, Yoruba, Igbo and probably Tiv language.

Equally, the 50 selected lexical items reveal a great deal not only about the lexical meaning but also its distributions and lexical root formation. The researcher however found out that some of the words selected for analysis have no dictionary or literal meaning while some others have. In spite of this however, the lexical root formation show a bit of blending. In that some of these terms are formed from the English language, local

words and sounds of objects. At the contextual level, there is a semantic shift in the meaning of the terms; they exhibit meanings totally different from their use in the actual or original context.

Lastly, it was discovered by the researcher that the essence of contextualizing words in this manner is not

Conclusion

This research has demonstrated that language is dynamic and complex and that this is reflected in the way it often changes. The research has shown that through the analysis of the selected words that the military terms are made up of majorly informal terms which indeed have their own meanings. The words are made up of both foreign and local usages and some are totally military inventions. Equally, this research has been able to

Recommendations

The researcher considers this research as a step towards a further study particularly in the area of informal use of language in the military. And as such he is recommending more studies to be conducted in this area most especially as it affect the military. Thus the following:

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only to ease the pressure of communicating but also to foster group identity in the military domain of language usage. What even makes this mush more interesting is the fact that some of these terms are invented for this purpose. Consider words like: 'titi kaka', 'kelebe', 'samaqwe', 'shara', among others, their meanings are strictly context bound.

confirm the existing study in the field of language and social discourse or situation. From a pedagogical point of view, the analyses of informal usages such as this will not only be relevant to the students in the classroom setting but also to the teachers. It will make them to be aware of such terms and their meanings. Equally, study such as this provides a better way of documenting these terms so as to preserve them from language extinction.

- i. That the upcoming researcher can look in the syntactic formation of the informal usage of these terms in the military.
 - ii. Equally, that in-debt analysis or research of its morpho-syntactic analysis should be carried out.
- Also, the upcoming researcher can examine the area of language and ideology behind such usage.

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CREATIVITY QUOTIENT AND ACADEMIC ACHIEVEMENT OF UPPER BASIC SCHOOL STUDENTS IN FEDERAL CAPITAL STUDENTS TERRITORY, ABUJA, NIGERIA.

Nnonyelum Ogochukwu Anthonia

Department of General Studies,
Nigeria Army College of Environmental, Science and Technology, Makurdi, Benue State.
email: toniaogoo2015@gmail.com
08038005057.

Nweke Nsiebgunam Chinwe

Department of Psychology, University of Abuja, FCT Abuja
email; cizzypresh60@gmail.com,
09049064277

Meyaki Ojoh Amanda

Department of General Studies,
Nigeria Army College of Environmental, Science and Technology, Makurdi, Benue State.
email: amandameyaks@gmail.com
07031565020

Abstract

Creativity quotient (CQ) is a measure of an individual's ability to think creatively and solve problems using innovative and original ideas. Creativity is one of the most relevant skills to have in the 21st century with employers and government searching for individuals that have the creative abilities to proffer new solutions to arising problems. The purpose of the study was to assess association between creativity and academic achievement of upper basic students in FCT Nigeria. A sample size of 394 students was chosen using the Glenn which is a table that specifies a sample size to be used in a given population. The researchers also adopted multi stage sampling method in order to break down the large number of data into smaller clusters that are manageable. The instruments used for the collection of data are the Creativity Quotient survey (CQS) and the Students' Academic Report (SAR). The creativity Quotient Survey is a Self-constructed questionnaire with a four-point likert scale on 29 items that intends to assess the creativity quotient of the students. Data was Pearson product moment correlation and Simple regression was used to test hypothesis. It was found that there is significant association between creativity quotient and academic achievement. The findings will be of great importance to teachers, curriculum planners, education and government.

Keywords: Creativity Quotient, Academic Achievement, upper basic

INTRODUCTION

1.1 Background to the Study

The education system has traditionally emphasized the importance of academic achievement as a measure of a student's success. However, in today's fast-paced and rapidly changing world, there is a growing recognition of the need for creativity and innovation in solving complex problems and

adapting to new challenges Creativity simply means to generate something new. It is the ability of an individual to think out of the box by finding connections between unseeingly related concepts and using these findings to come up with new and better ways of solving human problems. Creativity

is one of the most relevant skills to have in the 21st century with employers and government searching for individuals that have the creative abilities to proffer new solutions to arising problems. Creativity is required for entrepreneurship and

There has been a growing interest in exploring the relationship between creativity quotient (CQ) and academic achievements students. Upper basic students, who are typically between the ages of 12 and 15, are at a critical stage in their cognitive and social development. They are beginning to form their identities and aspirations, and their educational experiences can have a significant impact on their future opportunities and success. Therefore, it is important to understand how the development of CQ may affect their academic achievements. Sadly, the Nigerian educational system and curriculum developers do not support creative ability growth. Students are more or less expected to memorise what the teacher has taught them in order to pass

1.2 Statement to the Problem

Nigeria's education system has been criticized for its lack of emphasis on creativity and innovation. The system is often criticized for being overly focused on rote learning and memorization, which can limit

Despite efforts to improve the education system, many Nigerian students continue to struggle with academic achievements, particularly in science, technology, engineering, and mathematics (STEM) fields. There is a growing concern that this may be due, in part, to a lack of emphasis on creativity and in the education system.

Aims and Objectives of the Study

It is in view of these problems, that this study is guided by eight objectives¹.

1. Find out the creative quotient of secondary students in FCT
2. Find out the academic achievement of secondary students in FCT
3. Find out the relationship between creativity quotient and academic achievement of secondary students in FCT

linked to overall success in life. This implies that educators are charged with the task of producing graduates that are not only academically sound but highly creative.

examinations. Educational shareholders are solely focused on academic achievement which is making good grades at the detriment of creative skills. Students with creative personality traits are often seen as deviant students and can be punished for going against the norm. It is important to change this narrative and encourage educators to create classrooms environments that stimulate creativity. A study that highlights the interdependence of creativity quotient and academic achievement might showcase creativity quotient as an important tool to achieving educational goals. Gender differences and subject areas specialisation might also affect the relationship between creativity quotient and academic achievement of students

students' ability to think critically and creatively. This raises concerns about the relationship between creativity and academic achievements of Nigeria students, as well as the long-term implications for their success in a rapidly changing global economy.

innovation in the education system. This study seeks to explore the relationship between creativity and academic achievements of upper basic students in FCT and to identify the factors that may be hindering the development of creativity

4. Find out the relationship between creativity quotient and academic performance of male students in Makurdi
5. Find out the relationship between creativity quotient and academic performance of female students in FCT
6. Find out the relationship between creativity quotient and academic performance of Arts students in Makurdi

7. Find out the relationship between creativity quotient and academic achievement of science students in Makurdi

2. Literature Review

2.1 Conceptual framework

2.1.1 Creativity

Creativity refers to the ability to use one's imagination and come up with new and innovative ideas, concepts, or solutions to problems. It involves the process of generating, developing, and expressing original ideas that have value or significance. Creativity can be expressed in various forms, such as art, music, literature, science, technology, and

2.1.2 Academic achievement

Academic achievement refers to the level of academic success that a student has attained in their educational pursuits. It can be measured through various factors, such as grades, test scores, participation in extracurricular activities, research, and other academic accomplishments. Academic achievement is often seen as a reflection of a student's knowledge, skills, and abilities in a particular subject or field of study. Academic achievement represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college, and university. School systems

2.3 Factors that Promote Creativity Quotient

According to Oeuriex et al (2000). there are several factors that can increase an individual's CQ for academic achievement, including:

Exposure to diverse experiences: Exposure to diverse experiences and ideas can broaden an individual's perspective and help them think outside the box. This can be achieved through activities such as travel, volunteering, and participating in creative or artistic endeavours.

2. Encouragement of creativity: Encouragement and support from parents, teachers, and peers can

Exposure to challenges and obstacles: Exposure to challenges and obstacles can stimulate creativity as individuals are forced to come up with innovative

8. Find out the relationship between creativity quotient and academic performance of Commercial students in Makurdi

business, and it plays a crucial role in human progress and advancement. It requires a combination of skills, including the ability to think critically, make connections between disparate ideas, take risks, and persevere through challenges. Ultimately, creativity is about using one's unique perspective and talents to bring something new and valuable into the world.

mostly define cognitive goals that either apply across multiple subject areas (e.g., critical thinking) or include the acquisition of knowledge and understanding in a specific intellectual domain (e.g., numeracy, literacy, science, history). The meaning of academic achievement can vary depending on the context and the standards set by educational institutions or society as a whole. However, in general, academic achievement is viewed as an important indicator of a student's potential for future success in their chosen profession or career path. It can also be a factor in determining eligibility for scholarships, grants, and other academic opportunities

foster an individual's creativity and boost their confidence in their creative abilities. Providing opportunities for creative expression and recognizing and celebrating creative achievements can also help to increase an individual's CQ.

Time for reflection and brainstorming: Allowing time for reflection and brainstorming can give individuals the space they need to generate creative ideas and solutions. This can be achieved through activities such as journaling, meditation, or simply taking breaks to let the mind wander.

solutions. Encouraging individuals to take risks and learn from failure can also help to increase their CQ.

Collaboration and teamwork: Collaboration and teamwork can encourage creativity by providing individuals with different brainstorming, exposure to challenges and obstacles, and collaboration and teamwork.

Overall, the development of CQ for academic achievement involves a combination of factors including exposure to diverse experiences,

2.4 Factors that Blocks Creativity Quotient in Academic Achievement

There are several factors that can block creativity quotient (CQ) in academic performance of students. (Oeurix et al (2000). (These factors can inhibit an

individual's ability to think creatively and come up with innovative solutions. Some of these factors include:

1.Fear of failure: Fear of failure can prevent individuals from taking risks and trying out new ideas, which can limit their creative thinking and

problem-solving abilities. This fear may be rooted in societal or cultural expectations, or past experiences of negative feedback or criticism.

1.Emphasis on conformity: An overemphasis on conformity and adherence to rules and guidelines can stifle creativity as individuals may feel constrained by

the existing framework and discouraged from exploring new ideas or approaches.

2.Lack of autonomy: When individuals are not given autonomy in their academic pursuits, they may feel less motivated to be creative and innovative. This may

occur when students are not given the opportunity to choose their own projects or are given strict guidelines to follow.

3.Time pressure: When individuals are under time pressure to complete academic tasks, they may feel less inclined to take risks and try out new ideas. This

can lead to a focus on completing the task quickly and efficiently rather than on exploring creative solutions.

4. Lack of resources: A lack of resources, such as access to technology or funding for research, can limit individuals' ability to explore creative solutions to academic problems. This can create a sense of frustration and limit the scope of what individuals feel they can achieve.

overemphasis on conformity, lack of autonomy, time pressure, and lack of resources. It is important for educators to be aware of these factors and to create an environment that fosters creativity and innovation by encouraging risk-taking, autonomy, and exploration of new ideas.

Overall, factors that block CQ in academic performance of students include fear of failure, an

2.5 Theoretical Review

Theories namely humanistic theory of Maslow and Rogers, Creative theory of psychoticism by Eysenck and Componential theory of creativity

2.5.1 Humanistic theory of creativity

The theory is postulated by Maslow, it opines that human beings have six basic needs that drive

achievement and informs our choices and actions. These needs are hierarchical and might vary in

hierarchy from one person to the other or in different situations or timeline in one's life. This theory is relevant to this study because creativity and academic achievement for as a requirement for a job, entrepreneurship or life success which in turn brings

2.5.2 Creative theory of psychoticism

The theory was postulated by Eysenck in 1993, theory of psychoticism in personality and how it could relate directly to creativity. The main topic covered is Eysenck's view of psychoticism as a dimension of personality and temperament. Eysenck's theory of psychoticism is based on mostly physiological factors. It states that normal subjects who are not diagnosable

2.5.3 Componential theory of creativity

The componential theory of creativity was articulated by Teresa Amabile in 1983. A theory designed to be comprehensively useful for both psychological and organizational creativity research, it describes the creative process and the various influences on the process and its outcomes. Two important assumptions underlie the theory. First, there is a continuum from low, ordinary levels of creativity found in everyday life to the highest

2.6 Review of Related Literature

The study looked extensively to related previous studies that are similar to this study in terms of the

Balgiu & Aliu (2013) analysed the relationship between students' performance in creative tasks and academic achievement obtaining no correlation

Ijaz, Tasheen Zalfiger and Mohammed (2012) investigated the influence of emotional intelligence and creativity on academic achievement using ex-post factor research design on a sample size of 235

Shruti and Geetika (2016) analysed the impact of creative quotient on students' participation and performance in Extra-curricular activities on a

Olatoye, Akintunde and Ogunsaya (2010) investigated relationship between students' creativity and academic achievement of 235 HND students in

food, shelter, security, recognition, acceptance and many more which are basic human needs could drive individuals to pursue enhancing their creative skills and academic achievement.

psychotics can, under certain circumstances, exhibit some qualities commonly found among psychotics. It is also shown how he ascribes this theory to creativity and how the genetic and psychological traits of psychoticism and creativity are found to be greatly overlapping. The theory supports the work which agrees that people do better academical if given opportunity to work on novel situations.

levels of creativity found in historically significant inventions, performances, scientific discoveries, and works of art. The second, related underlying assumption is that there are degrees of creativity in the work of any single individual, even within one domain. The level of creativity that a person produces at any given point in time is a function of the creativity components operating, at that time, within and around that person.

relationship between creativity and academic achievement.

between creativity and its parameters on academic achievement.

students noting that emotional intelligence and creativity when combined predicted academic achievement of the students.

sample size of 300 students in Chandigarh noting that increase in creative quotient increased participation in extracurricular activities.

South western states of Nigeria noting insignificant relationship between creativity and academic achievement.

Gyuse, Achor, and Chianson (2014) examined how creative secondary school students are in Makurdi using a survey of 300 students noting that majority of the students did not know what creativity was but

3.1 Methodology

This section presents the research design used, population of the study, sample size, sampling procedure, instrumentation, validity and reliability of

The research design used for this study is the descriptive survey design and correlational research design. The researcher adopted the descriptive survey design as the researcher was interested in investigating the characteristics of the population i.e the demographics of the population: no of male and female, number of Arts, Science and Commercial

3.2 Sample and Sampling Technique

The population of the study is 24,721 JSS 3 students of public schools in Makurdi. A sample size of 394 students was chosen using the Glenn which is a table. The researcher also adopted multi stage sampling method in order to break down the large number of data into smaller clusters that are manageable. At the first stage, the researcher used hat and draw method to isolate the selected schools. The sample size of 394 students was equally divided among the schools. The participants were randomly selected at the schools when the researcher visited the schools after their consent was given.

3.4 Instrumentations

The instruments used for the collection of data are the Creativity Quotient survey (CQS) and the Students' Academic Report (SAR). The creativity Quotient Survey is a Self-constructed questionnaire with a four-point likert scale on 29 items that intends to assess the creativity quotient of the students. The 4 points had options like Often (4 points), Sometimes (3 points), Rarely (2 points) and Never (1 point). The sum of these points is 10 and when divided into 4, is 2.5 making 2.5 the decision point where any point from 2.5 and above becomes agree and points less than 2.5 becomes disagree. The questionnaire was

expressed creativity. They also noted that boys were more creative than girls and science students were more creative than non- science students.

the instrument, data collection procedure and method of data analysis.

students and also interested in the distribution of the variables. This research design enabled the researcher analyse the data statistically using frequency counts, mean, etc. The correlational research design was also adopted to investigate the relationship that exists between the two variables; creativity quotient and academic achievement.

that specifies a sample size to be used in a given population.

the first stage, 12 public schools were randomly selected out of 6 Area councils using stratified random sampling procedure. among the 6 Area councils making it 66 respondents per Area council.

validated by my supervisors and two other experts in the faculty who made sure that the questionnaire had content, was relevant and unambiguous. The reliability of the questionnaire was established after a pilot was conducted using a test- retest method of reliability. The questionnaire was administered to 20 GSS Gwagwalada students twice and scores of the two sets of tests were analysed using the Pearson Product Moment correlation. The index value of the correlation is 0.82 making the questionnaire reliable.

The Students' Academic Record of Students scores in Mathematics, English, Social and Basic Sciences were collected from the school authorities and analysed. Students with a mean score of 2.5 and above was collected.

The questionnaire was administered to the respondents with the help of two research assistants.

The students completed the questionnaires and the questionnaires were collected on the spot.

In analysing the data, the researchers adopted the descriptive survey research design to answer the research questions and the demographic data. Inferential statistical tools; Pearson product moment correlation and Simple regression was used to test hypothesis

4. Discussion and Results

4.1 Demographic Data

The data on respondents' gender and field is presented in this section.

Table 1: Distribution of Respondents according to Gender

Gender	Frequency	Percentage
Male	149	37.8
Female	245	62.2
Total	394	100.0

Table 2 shows that 149 respondents (37.8%) were male while 245 (62.2%) respondents were female. This implies that the female was more than the male in this study.

Table 2: Distribution of Respondents Based on their Field

Field	Frequency	Percentage
Arts	148	37.6
Sciences	98	24.9
Commercial	148	37.6
Total	394	100.0

Table 2 shows that the number of respondents by their field of study. Arts students were 148 with a percentage of 37.6%, Sciences were 98 (24.9%) while commercial were 148 37.6%

respectively. This shows that there that majority of the respondents in this study were Arts and Commercial as at the time of this study.

4.2.2 Answer to Research Questions

Research Question One: What is the creativity quotient of secondary school students in FCT, Abuja?

Table 3: Creativity Quotient of Secondary School Students**N=394**

S./No.	Items	Mean	Std. Dev.	Decision
1	Making discoveries through trial and error	3.45	0.70	Agree
2	Trusting hunches or instincts	3.35	0.79	Agree
3	Ideas arising whilst dreaming	3.58	0.72	Agree
4	Methodical and systematic problem solving	3.38	0.72	Agree
5	Sudden moments of inspiration in waking life	3.45	0.69	Agree
6	Rational, logical thought	3.52	0.71	Agree
7	A sense of communicating with a deeper sense of self	3.53	0.60	Agree
8	The careful selection of ideas	3.53	0.68	Agree
9	Loose, playful, unconstrained thinking	3.78	0.49	Agree
10	Following your intuition	3.42	0.63	Agree
11	Ideas arising as falling asleep or waking up	3.47	0.72	Agree
12	Meditation	3.20	0.73	Agree
13	Paying attention to visual imagery	3.57	0.55	Agree
14	Experiences of losing track of time when involved...	3.32	0.78	Agree
15	Playing with ideas	3.52	0.74	Agree
16	Luck, chance, 'fortunate accidents'	3.16	0.85	Agree
17	The use of analogy	3.33	0.79	Agree
18	A sense of purpose that seems to come from...	3.59	0.63	Agree
19	Recombining existing elements in new ways	3.54	0.67	Agree
20	Working with a set goal or outcome in mind	3.37	0.71	Agree
21	A sense of channelling information	3.52	0.65	Agree
22	Paying attention to auditory impressions	3.52	0.58	Agree
23	Day dreaming	3.25	0.76	Agree
24	The release of negative emotions	3.00	0.91	Agree

25	Non-verbal modes of thinking	3.36	0.73	Agree
26	Positive emotions, e.g. joy, excitement, euphoria	3.25	0.84	Agree
27	Paying attention to bodily feelings	3.41	0.80	Agree
28	A sense of communicating with something other	3.56	0.69	Agree
29	A sense of being in tune with nature or the universe	3.60	0.56	Agree
Sectional Mean/Std Dev		3.43	0.71	

Table 3 presents data with respect to the creativity quotient of secondary school students in FCT, Abuja. The analysis shows agreement with all

items. The sectional mean of 3.43 indicates that creativity quotient of seen to be present amongst students in the study area.

Research Question Two: What is the academic performance of secondary school students in FCT, Abuja?

Table 4: Academic Performance of Secondary School Students

Subjects	Minimum	Maximum	Mean	Std. Deviation
English Language	40.00	99.00	70.81	16.44
Mathematics	33.00	98.00	67.07	15.40
Basic Science	39.50	95.00	68.94	12.11
Social Studies	40.00	98.00	68.24	14.10
Academic Performance	41.13	95.75	68.77	12.01

Table 4 shows the academic achievement of secondary school students in FCT, Abuja. The minimum score of students in English Language is 40 while the maximum score is 95 with a mean score on 70.81. In Mathematics, the minimum score of students in 33 while the maximum score is 98 with a mean score of 67.07. In Basic Science, the minimum score of students in 39.50 while the

maximum score is 95.0 with a mean score of 68.94. In Social studies, the minimum score of students in 40 while the maximum score is 98 with a mean score of 68.24 respectively. The overall mean academic performance of students is 68.77 which indicates performance level that is above average in the study area.

4.2 Recommendations and Conclusion

In view of the findings of this study, it is important that students should be encouraged to enhance their creative quotient by giving them the freedom to try new things.

Emotional intelligence and creativity should be taught, facilitated and assessed as a separate course in the education system.

School authorities should manage students and teachers in a way that encourages culture of creativity values

Learning should be rich in team spirit, tolerance of genuine mistake caused by creative disposition so to boost creativity quotient of students.

In conclusion, the researcher found out that enhancing creativity quotient of students equally enhances the academic performance of students despite their gender or subject area specialisation

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MAINTENANCE CULTURE: AN ANTIDOTE TO BUILDING COLLAPSE IN NIGERIA.

ISHAKU HABU

School of Environmental Sciences
Department of Building Technology
Nigerian Army College of Environmental Science and Technology Makurdi,
Benue State, Nigeria.
email: deseniormanutd4life@gmail.com

Abstract

Cinderella attitude of Nigerians on maintenance culture has negatively affected infrastructural development which is critical and essential to a Nation's development. Achieving millennium goals would be attainable if existing structures and facilities are constantly maintained. Poor maintenance culture has drawn the nation a thousand steps backward and one of the stride actions that could salvage the country from the total mess of infrastructural decay and loss of life is maintenance. This paper is aimed at examining maintenance culture: An antidote to building collapse in Nigeria through review of archival materials and participative observations. Poor leadership, corruption, attitudinal problem and lack of maintenance policy were identified as major causes of the menace. In conclusion, the paper recommends the inclusion of maintenance culture in national educational curriculum, maintenance policy formulation and appointment of facility managers among others as necessary steps towards making the country among the comity of developed nations.

Keywords: Maintenance Culture, Building Collapse, Maintenance Policy, Prospects and Challenges.

INTRODUCTION

Building maintenance has until recently been a neglect field of technology, being regarded by many as a "CINDERELLA ACTIVITIES" (seeley,2004). It's possesses little glamour. It is a known fact that it is highly desirable but hardly feasible to produce buildings that are maintenance-free, although much can be done at the design stage to reduce the amount of subsequent maintenance work. All elements of buildings deteriorate at a great or lesser rate depending on materials and methods of construction, environmental conditions and the use of the building. Maintenance culture essentially deals with the study of the occurrence of building defects and the remedies which such defects would require. The maintenance of the built environment affects everyone continually, for it is on the state of our homes, offices and factories that we depend not only for our comfort, but for our economic survival. Maintenance starts the day the Builder leaves the site. Design, materials, workmanship, function, use and their inter-relationship, will determine the amount of maintenance required during the lifetime of the building. Effective building maintenance requires the correct diagnosis of defects, and implementation of the

correct remedial measures, all based on sound technical knowledge.

Maintenance culture in this study suggests the habit of regularly and consistently keeping a building, machine, facilities, equipment, infrastructures etc in good and working condition. In support of this assertion, Suwaibatul- Islamiah, Abdul-Hakim, Syazwina, & Eizzatul (2012) posited that maintenance culture is the values, way of thinking, behavior, perception and the underlying assumptions of any person or group or society that considers maintenance as a matter that is important and practices it in their life. If a nation must develop, it is imperative that installation as well as maintenance of its existing facilities be given priority. This is more so for developing nations like Nigeria where there is a huge gap between the supply and demand for such facilities due to high rate of population growth and other factors (Dabara, et al 2015). Nigerian government, according to Eti, Ogoji, & Probert (2006), took certain economic steps towards being among the best twenty economies in the world by the year 2020. Attaining sustainable infrastructural development by successive governments and cultivation and practicing maintenance culture are essential in

achieving this vision. Infrastructure facilities generally referred to as economic and social overhead capital which includes education, water supply, sewage systems, and energy. Others are postal and telecommunication services, transport system, hospitals and roads (World bank, 1994; Oluwasegun, Okorie, Dabara, & Abdulazeez, 2013; Dabara, et al 2016). Governments (Federal, State and Local), private organizations and individuals need to have a strategy on how to maintain their infrastructural facilities to ensure sustainability of same. This can be achieved through maintenance culture which is said to have a correlation with national development.

Contribution of private organizations into national development cannot be over-emphasized in term of facilities construction (industrialization), environment conservation, employment generation and assisting government businesses through prompt payment of taxes. These, opined Nahimah (2008), are achievable when companies' operational facilities (machines) are continuously reliable, available and maintainable throughout their installed service years. Eti et al. (2006) opined that a developing society needed to adapt to change and faster creativity. To these authors, the pursuit of continual improvement, implementing wise maintenance schedule are essential for contemporary

Conceptual Framework and Literature Review

Maintenance

BS 3811³ defines "maintenance" as work undertaken in order to keep or restore structures to an acceptable standard. It went further to define it as the combination of all technical and associated administrative actions intended to retain an item in, or restore it to, a state in which it can perform its required function. British Standards Institute (1974) considered maintenance as the combination of technical and administrative actions taken to preserve or protect a structure, system or equipment to function properly. On its own part Advanced Learner's Dictionary (2009) defines maintenance as the action or process of preserving an object, activity etc. While Kumar & Suresh (2008) postulated that maintenance is an action taken to prevent a device or component from failing or to repair normal equipment degradation experienced with the operation of the device to keep it in proper working order. This paper therefore considers maintenance as a process of preserving an asset or facility in its state of continuous use and function, above a

years. They further argued that challenges in maintenance management among Nigerian industries resulted in low availability of materials, and productivity which eventually could lead into the closure of certain industries. Assets and facilities are essential to an organization's resources, thus improving the working environment and well-being of their maintenance is an important aspect that should be given serious attention. This is where there is need for adequate and constant maintenance awareness for all the members involved in the organization's facility management towards achieving the cooperate goal of the firm. However, the problem of maintaining the Nation facilities has become an important agenda for the country and mounts pressure on government in the aspect of managing its assets and facilities, (Annie, 2007; Ajibola, 2009; Ankeli, Dabara, Oyediran, Guyimu, & Oladimeji, 2015). As agents of national development for improving the quality of infrastructure in our society, need maintenance culture at governmental level and private sectors as well as individual levels. It is on this note that, the paper addresses causes and effects of poor maintenance and way out of the menace in order for our country to realize her dream.

minimum acceptable level of performance, over its design lifespan.

Companies undertake efforts to reduce costs and at the same time improve quality and productivity. These efforts include an examination of the maintenance requirements. The production system of any company requires effective maintenance attention necessary for its continuous functioning (Omotehinshe, et al., 2015a). This will increase equipment life, availability and retains its proper functioning. Poorly maintained equipment may conversely lead to more frequent failure of the equipment, low utilization rate and delaying of production schedule. Equipment that is malfunctioning or misaligned may cause a higher scrap rate or produce products with a questionable quality. Swanson, (2001) considered poorly maintained equipment as a necessary evil. This is contradicted by Alsyouf, (2007) who saw regular facility maintenance as a source of profit making rather than just unavoidable and unpredictable expenses.

Maintenance culture

According to Suwaibatul et al. (2012), Maintenance culture is the values, way of thinking, behavior, perception and the underlying assumptions of any person or group or society that considers maintenance as a matter that is important (priority) and practices it in their life. When a person or group has maintenance culture, they would have the attitude to maintain, preserve and protect the public facilities. Maintenance culture is not universal in nature, Florence (2011) postulated. It is usually derived or learns through a person making maintenance a natural

Needs for Maintenance Culture

Regular maintenance is essential to keep structures and work environment safe and reliable. It helps to eliminate hazards. Lack of maintenance can lead to dangerous situations, accidents and health problems. It is important that all maintenance work is risk assessed before beginning the task. A thorough adherence to a well-defined and developed maintenance strategy will take care of facility breakdown or malfunction thereby allowing facility managers to concentrate on capitalization (Omotehinshe et al., 2015a; Akinyemi, Gambo, Ankeli, & Dabara, 2016). In the absence of this, measurable time will be required to develop and define a maintenance strategy, communicate it, and last focusing on the tactical choice, for how to achieve it. Tactics are the actual activation needed to implement the strategy, which concerns the management of processes, people, and physical asset infrastructure (Campbell & Reyes-Picknell, 2006). The management's objectives must be realized in accordance with safety, environmental

Taxonomy of Maintenance

There are many philosophies of maintenance. However, this paper intends to limit itself to those that concerned facility maintenance, some of which are discussed below, see figure 1 below:

Planned maintenance: The maintenance organized and carried out with fore thought, control and the use of records to a predetermined plan.

Unplanned maintenance: The maintenance carried out to no predetermined plan. This is the restoration of sudden defective facility to its functional state.

Preventive maintenance: The maintenance carried out at predetermined intervals or corresponding to research criteria and intended to reduce the probability of failure

daily practice that can be followed and emulated by others. According to Mark et al. (2006), the concept of maintenance culture is the internal environment between management and staff in ensuring effective maintenance through the sharing of ideas, beliefs, and values of each member in an organization. Developing and embracing maintenance culture through effective leadership, sound policy, attitudinal development among others would not only enhance national development but also enlist our country among the comity of developed nations.

regulations and also in a cost-effective way. The integration of machines, men, methods and means into a well-designed strategy requires indispensable managerial capacity (Waeyenberghad & Pintelon, 2002).

Below are some of the accruable benefits if maintenance culture is embraced in our society:

- Keeping structures in utmost working condition in order to minimize downtime and disruption to services.
- Keeping facilities in a state of good repair for the owner's health and safety.
- Keeping buildings from deteriorating in appearance and aesthetics.
- Keeping facilities so as to optimally achieve their full potential service life.
- Leveraging efficiencies that can be reflected on the owner's statement of financial position.
- Satisfying a legislated duty that is owed to owners, occupants and guests on the property
- Preventing unnecessary damage to assets or facilitation that may result in their performance failure

or the performance degradation of an item. Preventive maintenance is an action performed on a time or machine run based schedule that detect, preclude, or mitigate degradation of a component or system with the aim of sustaining or extending its useful life though controlling degradation to an acceptable level (Kumar & Suresh, 2008). This approach to maintenance management is predominantly recurring or time-driven tasks performed to maintain acceptable levels of availability and reliability (Mobley, 2002). Comprehensive preventive maintenance programs schedule repairs, adjustments machine rebuilds for all critical equipment while more limited programs only consist of minor adjustments and lubrication. The scheduling guideline for these programs is the common

denomination due to the fact that, all preventive maintenance management programs assume that equipment will degrade within a certain period of time (Mobley, 2004). The strategy is cost effective, energy saving as well as increased component life cycle and

reduced equipment or process failure. The problem with the preventive approach to maintenance is that the operation mode and plant specific variables have a direct impact on the normal operating life of equipment.

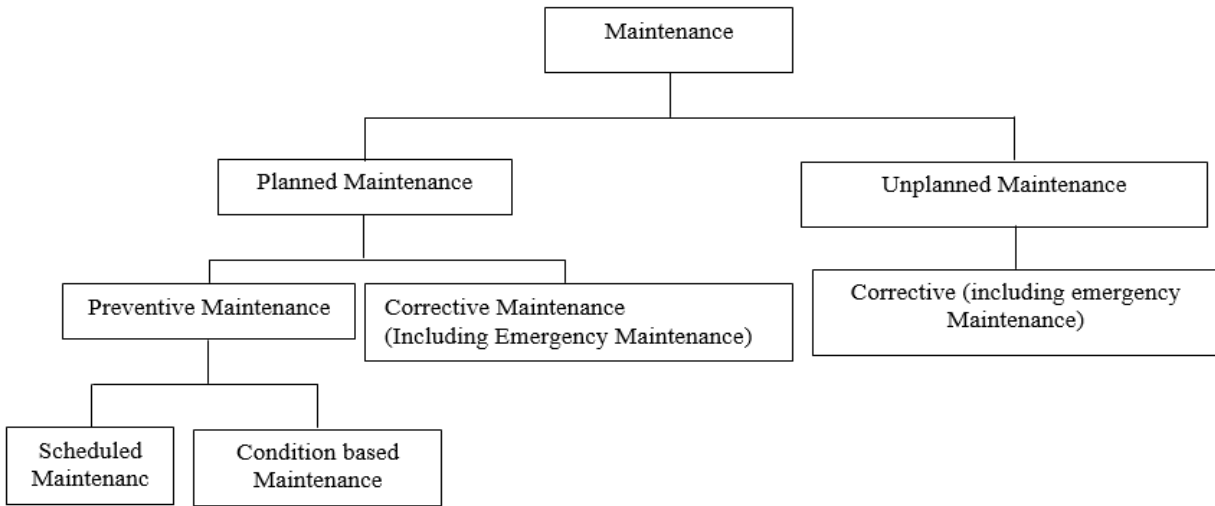


Fig. 1: Maintenance Classification
Source: British Standard Institute, 1998

Corrective Maintenance: The maintenance carried out after a failure has occurred and intended to restore an item to a state in which it can perform its required function. This maintenance strategy is simple and straightforward, “fix it when it breaks” (Mobley, 2004) i.e., the defective items are fixed either after failure or during failure (Moubray, 1997). The corrective technique does not take any maintenance action until failure occurred. This maintenance management philosophy is rarely used altogether without any preventive tasks, (lubrication and adjustment). Still, in a corrective environment, the equipment is not rebuilt nor repaired in greater extent until it fails to operate (Mobley, 2004). This enjoyed low-cost investment for maintenance and

few staff is required. **Emergency maintenance:** The maintenance which is necessary to put in hand immediately failure occurred to avoid serious consequences, (Mobley, 2004). This is sometimes referred to as day-to-day maintenance, resulting from such incidences as gas leaks and damage. **Schedule maintenance:** The preventive maintenance carried out to a predetermined, say, interval of time, number of operations or mileage. **Condition-based maintenance:** The preventive maintenance initiated as a result of knowledge of the condition of an item from routine or continuous monitoring, see figure 2.

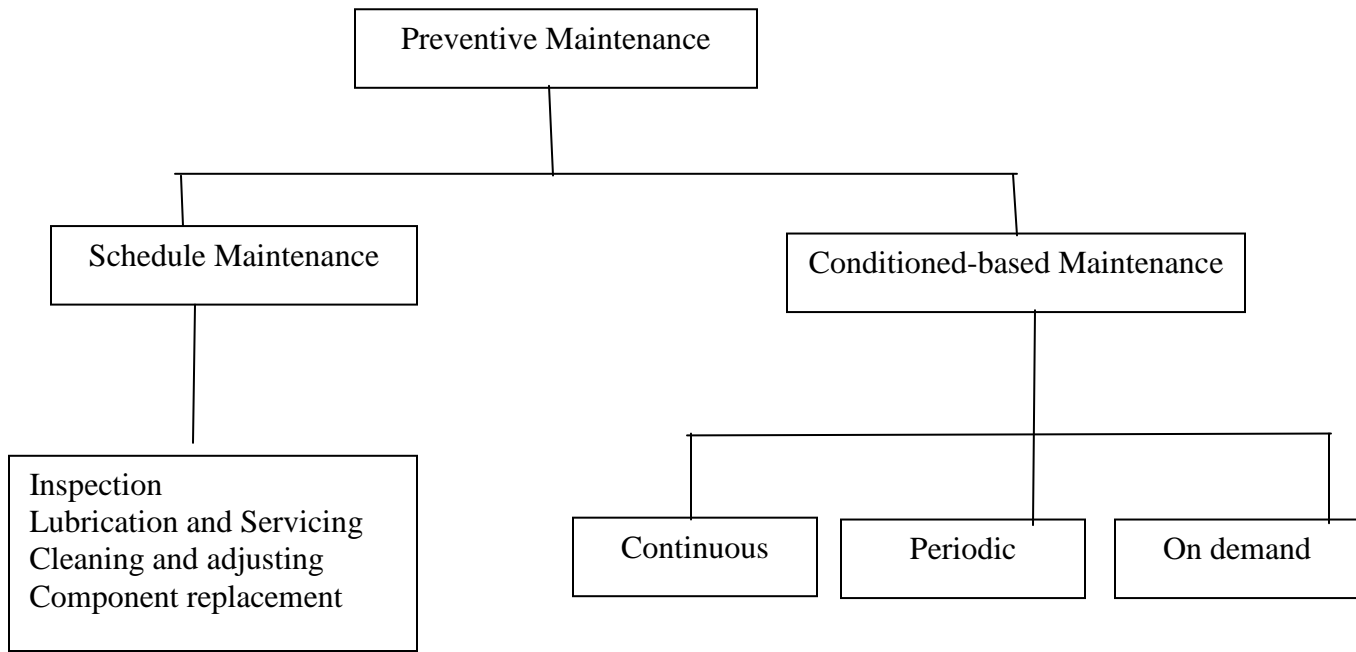


Fig. 2: Condition-based maintenance
Source: Mobley, 2004

Culture

There is no single universally accepted definition of culture (Omotehinshe et al., 2015b) because it is difficult term to define. Definitions tend to vary from one country to another, one continent to another. What is morally acceptable in one country may be abominable in another. Culture is that complex which includes knowledge, belief, art, morals, law, custom and any other capabilities and habits acquired by man as a member of society (Tyler, 1870). Culture consists of patterns, explicit and implicit, of and for behavior acquired and transmitted by symbols, constituting the distinctive achievements of human groups, including their embodiment in artefacts. Essential core of culture consists of traditional (historically derived and selected) ideas and especially

their attached values. Culture system may, on the one hand, be considered as product of action or as conditional elements of future action (Kroeber & Bluckohn, 1952). Culture is a fuzzy set of basic assumptions and values, orientations to life, policies, procedures and behavioral conventions that are shared by a group of people, and that influence (but do not determine) each member’s behavior and one’s interpretations of the ‘meaning’ of other people’s behavior. Therefore, culture consists of (overall activity of) attitudes, values, basic assumption, arts, customs, belief, and embodiments that shape the behavior of individuals in a given society. In simple term, people’s culture is the summation of their complete way of life.

Maintenance Culture

According to Suwaibatul et al. (2012), Maintenance culture is the values, way of thinking, behavior, perception and the underlying assumptions of any person or group or society that considers maintenance as a matter that is important (priority) and practices it in their life. When a person or group has maintenance culture, they would have the attitude to maintain, preserve and protect the public facilities. Maintenance culture is not universal

in nature, Florence (2011) postulated. It is usually derived or learns through a person making maintenance a natural daily practice that can be followed and emulated by others. According to Mark et al. (2006), the concept of maintenance culture is the internal environment between management and staff in ensuring effective maintenance through the sharing of ideas, beliefs, and values of each member in an organization. Developing and embracing maintenance culture through effective leadership, sound

policy, attitudinal development among others would not only enhance national development but also enlist our

Building Collapse: is the sudden structural failing, partially or entirely, of a building, threatening human life and health. Building collapse in Nigeria has been on the increase in recent times. There are frequent media reports of collapsed buildings in major Nigerian cities and other parts of the world. The reasons a building collapses can be due to poor structural design, poor compliance with specifications, poor quality control, faulty construction methodology, foundation failure, negligence to maintenance culture and natural disaster is also identified as a cause of building collapse.

Maintenance Policy: is a document produced, owned and managed by senior management. In the hierarchy of business governance, all policies flow from and sit below the company's vision, mission and values. As a factual statement of intent, a maintenance policy is a formal document. In another way, is a set of administrative, technical and managerial actions to apply during the life cycle of a structure, used to guide maintenance management decision making towards retaining certain operation conditions of a structure or dedicated to

Causes of Poor Maintenance Culture

The following are some of the identified factors responsible for the poor maintenance culture in our society:

Corruption: Obayelu, (2007) defines corruption as an effort to secure wealth or power through illegal means for private gain at public expense; or a misuse of public power for private benefit while Lipset & Lenz (2000) compared the growth of corrupt practices, in all its manifestations with human race. Oguniye (2009) in his work saw corruption as the exploitation of public position, resources and power for private gain. Corruption is not only found in democratic and dictatorial politics, but also in feudal, capitalist and socialist economies. Christian, Muslim, Hindu and Buddhist cultures are equally bedeviled by corruption (Obayelu, 2007). Corruption has threatened our national development because there is no effective and functional mechanism that can control the menace. A sitting government awards projects (without means of its completion) only to be abandoned by its successor due to personal gain. One government would award projects and build infrastructural facilities while successive

country among the comity of developed nations.

It was important that buildings continue to be properly maintained to ensure that they can function as efficiently and effectively as possible, the deterioration of buildings due to the lack of maintenance could lead to future financial burdens, pose legal and other industrial relations issues and affect the delivery of services. Identifying building problems and understanding of building materials and its mechanical and electrical systems are aspects of the process of preserving and conserving building quality and to ensure the efficiencies of the facilities

restoring the structure to said conditions. Apply preventive maintenance as much as possible. The Maintenance Managers shall identify any part of the building or facility for structural maintenance treatment using a system of regular inspections or other methods. The Maintenance Managers shall priorities any part of the building or facility in need of structural and planned maintenance works accordingly. Correct contractors for correct works, correct time and correct budget.

government who should maintain and consolidate on existing ones would totally abandon them because they believed that awarding new projects at inflationary cost would profit the administration rather than the public.

Leadership: Good and effective leadership is essential to national development. Ability to formulate policy, transform potential to reality and proper leadership to subordinate is the major features of a sound leader. Leadership is the process of influencing others to understand and agree about what needs to be done and how to do it, and the process of facilitating individual and collective efforts to accomplish shared objective (Yukl, 2006). Leadership also is the shifting of one's vision to high sights, the raising of man's performance to higher standards, the building of man's personality beyond its normal limitations (Peter, 1977). Few among our leaders are up to the tasks whereas majority of them really have no ingredient of effective leadership which may account for why most of the Nation's facilities are in shambles and decay. It is a general believe that one cannot give what one doesn't have. Most of our leaders lack maintenance culture, vision, passion and empathy (Omotehinshe et al., 2015b) which are some of the leadership ingredients

required to influence and stimulate people's behavior towards maintaining and sustaining existing facilities.

Poor Maintenance Attitude: More worrisome is Nigerian's attitude towards government property as well as their private properties. Public office holders, according to Peter (1977), hardly rehabilitate their official buildings or facilities until when such assets stand the danger of risking the life of the users. It is common knowledge in Nigeria that most incoming governments make little or no efforts in keeping existing facilities in a proper shape through maintenance and rehabilitation rather they would abandon the inherited facilities and embark on new ones with a view to draining the little resources of the state. Nonchalant attitude, noted Omotehinshe et al. (2015a), of individuals towards their health, building, cars amongst other had made them to spend huge amount of money on

things that ought to have been prevented or rehabilitated through the act of maintenance program.

Lack of Maintenance Policy: Another reason why most of our public and private facilities are in total state of mess is non-existence of maintenance policy. Policy is a law, regulation, procedure, administrative action, incentive or voluntary practice of governments and other institutions. There is no single blue print, program or scheme is it federal or state level on how public facilities should be maintained. Our elected legislators, both at the federal and state levels, are yet to take concrete steps in promulgating effective laws that would take cognizance of major maintenance problems encountered in the administration of public facilities. On their own part, executive arms are busy inaugurating ad-hoc committees or agencies on how to sustain, maintain and rehabilitate the nation's facilities in order to handle the national development.

Observations

Educational infrastructure

Sound and qualitative education is no doubt one of the catalysts of national development. This could be only achieved in a safe, orderly and conducive learning atmosphere that is hardly found in our society. Devastating state of infrastructural facilities from the basic schools to the higher institutions is worrisome. Socio-Economic Rights and Accountability Project (2013) opined that many pupils in this kind of schools continue to sit on the bare floor in some classes while lessons are going on. The classrooms are overcrowded with several broken chairs and desks. Pupils were also reportedly forced to work in order to repair defective chairs and desks, something which, according to the author, amounted to forced labour. The dormitories in our public schools are eye sour because they were no longer fit for human habitation. Service conditions of both external and internal facilities in these dormitories were in terrible situations. This could not support the claim of government providing quality education to its citizenry. This may, again, kill the zeal of students to attain best in them academic pursuit. Absence of equipped and modern library, other sport facilities to keep students physically and mentally fit may affect the standard and quality of education which in turn can mar the national development.

Individual Property

Nonchalant attitude of individuals towards their assets makes such assets undergo rapid deteriorations with passage of time. It was observed that people failed to go for regular medical check-ups to prevent malfunction organs or items in the body but rather prefer "fire brigade" approach whereby complete breakdown of body systems forced them to rush for medical attention. It is a common practice in Nigeria that whenever this lackadaisical attitude towards one's health becomes fatal, accusing fingers are always pointed at family members or business colleagues as the source of their predicament. Ignoring minor car maintenance attentions such as oil replacement, screen wiper, brake pads or reverse light could result in fatal accident. House leakages through roofing sheets or burst pipes; exposed power cable on wall surface and ruptured or burst waste pipes constitute health hazards to the house occupants. All these little or minor faults could be prevented through simple act of maintenance culture in order to ensure that our health and facilities are kept in good condition so as to enhance and sustain development in the society.

Industry

The nexus between industry and national development cannot be underestimated. Industry provides employment opportunity, facilities, environment conservation, and needed goods - all to foster national development. But one thing that can obstruct the achievement of the above

industrial benefits is breakdown of machines due to the effect of poor maintenance. Poor maintenance of production resources such as machines, equipment and materials can negatively affect the production outputs in terms of capacity reduction, increase in production cost, poor quality of product/services, and customer

Conclusion

This study examined the causes and implications of poor maintenance on national development in Nigeria. Maintenance culture is a bedrock of infrastructural and facility development which should not be taken with levity if standard of living is to be achieved. Poor leadership, lack of maintenance policy, attitudinal problem and corruption are identified among others as the major causes of poor maintenance. Different maintenance

Recommendations

On personal levels, we must imbibe maintenance culture in order to enjoy the best of our assets with a view to enjoying the best of life. How well we use and enjoy our facilities such as buildings, machines, cars, households' equipment, furniture or public physical assets or our bodies depend, largely, on how well we imbibe the culture of maintenance (Ajibola, 2009).

Based on the above observations, the following recommendations are hereby considered:

1. There should be National policy on maintenance culture that would be effective at the three tiers of government
2. Maintenance culture, as a course of instruction, should be introduced into all levels of Nigeria Education Curriculum

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dissatisfaction among others. It was observed that if a production manager did not take appropriate maintenance strategy designed by organization to keep the production system in a better service condition, production activities would suffer thereby affecting overall interest of the business organization.

strategies that could be adopted to retain and continuously keep facilities in a safe and good working condition were examined. Also suggested in the paper are formulations of maintenance policy, inclusion of maintenance culture in our educational curriculum, appointment of facility manager – all towards ensuring Nigeria is better positioned in the accomplishment of her vision 2020 goals.

3. Each state should, as a matter of duty, formulate maintenance policies that would guide its operational activities to enhance effectiveness and efficiency
4. Leadership selection should be by merit rather than favoritism or tribalism because accomplishment of maintenance goals hangs on leadership
5. A functional and workable anti-corruption system should be designed and installed in both private and public organizations with a view to preventing corrupt practices
6. Facility manager or officer should be appointed to continuously keep assets or facilities in good working condition
7. People should be sensitized and encouraged to embrace maintenance culture for the betterment of our dear nation.

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MANAGING COMMUNITY DEVELOPMENT ASSOCIATIONS FOR SUSTAINABLE DEVELOPMENT IN BENUE STATE

ODE U. ISAAC PhD.

email: odeisaac@gmail.com

08068063981; 08029878287; 08070606610

General Studies Department,
NACEST, Makurdi

Abstract

Community Development Associations are among the many community-based associations devoted to the socio-economic enhancement of their various localities in Nigeria and Benue State in particular. The survey method was adopted to find out how they could be better used to promote sustainable development of the communities. Utilizing two sets of questionnaires to obtain data from a sample of 528 respondents made up of 214 executive members of Community Development Associations and 314 non-executive members from the general population of the community, the data were analyzed using descriptive statistics. The results established Community Development Associations as occupying strategic positions to facilitate development in their communities because people look unto them for guidance on issues of development. The study found that a partnership between them and other development agencies could lead to enhanced development of Benue communities. It was recommended that Benue state and Local governments should enhance their organizational and operational capacities to produce the desired results.

Keywords: Channel, Community Development Associations, Opinion Leader, Development: Sustainable Development

INTRODUCTION

The fall in oil prices, the mover of the Nigerian mono-economy, has drastically curtailed government's ability to fund development programmes around the country. This has created an imperative for diversifying the economy through other avenues. The Federal government has, in this wise among other initiatives, considered it necessary to partner with community-based organizations, especially cooperatives, as a panacea for stimulating national economic growth and possible rural development.

Before the fall in crude oil price in the international markets, it has been critically observed that government presence in rural development has been declining over the years due to several factors including 'widening responsibilities, breakdown of public institutions that formerly catered for people's welfare, socio-economic transformations and difficulties in harnessing and

mobilizing resources enough to tackle development needs of the people." [Akinsorotan 2010, in Ode 2016; Shima 2007]. The shift in emphasis has led localities to form development associations with a view to providing shortfall in development needs according to their capability in resource mobilization. Therefore the current trend of working through community based organizations for socio-economic transformation appear very attractive even so as countries of South East Asia have used the same blueprint to grow development in their region [Yahaya 2003] where Government partnership with cooperatives is being fostered through provision of micro credit facilities because it is assumed that as organised community organizations, the effort will get to a broader spectrum of the nation's citizens to motivate them to engage in enterprises that could contribute to the country's GDP.

Conceptual Clarifications

Channel: This is applied here as a pathway for facilitating the movement of anything from one location to the other. In this work, the term is used as the pathway through which development inputs and messages travel between the innovation sources and the community receivers.

Community Development Associations: These are formal, and community based social, non-profit, non-guild, organizations formed to fill the gap of inadequate development efforts in localities. Such groups are bound together, among other things, by the desire to help improve the living conditions and the general welfare of their people.

Opinion Leader: A community leader is used here to mean someone or a group in a community who can propose a course of action to which others give their support or agree to a line of action suggested. He is, or that organization or that person that speaks and others within the community would listen. Such a person or organization is generally accepted in the community, probably because of his family status, social attainment, transparency, charisma, dependability, education or other cherished attributes accepted to the community.

Development: This is used here to denote any beneficial and positive action that brings about progress in the physical infrastructure, education, health and the social life of people. It will also apply to results of all initiatives taken to improve the standard of living of members of any community.

Sustainable Development: Sustainable development is used here to mean the ability to create structures and benefits that can outlive the physical presence of those who create them. For example, if an organisation brings into a community the idea or builds a borehole to give water to that community, it is implied here that there has to be in existence members of the community who can maintain and ensure that the borehole continues to function, be accessible and be maintained and managed by members of that community long after those who initiated the project are no longer with them.

Theoretical Framework The study anchored on the theories of modernization (because it doesn't fit into development paradigms in the third world countries like Nigeria) diffusion of innovations as well as the participatory theories. Inagaki (2007), for example, found that modernization and participatory theories continue to

inspire and are the most applied theories that drive development projects in many parts of the world. His report states that eight (8) projects/studies applied modernization theory, seven (7) used diffusion of innovation while participatory approach informed twelve (12) projects. Other theories, a mixture of modernization and participatory, political behaviour theory, social interaction theory, social movement, social network, hermeneutics and technology for development were applied on the ten (10) remaining projects / studies or reviewed (Inagaki, 2007 p.10). Modernization theory cannot benefit development initiative of third world countries because it is heavily derived from the dependency theory perspective and seen from the imperialist point of view where information and development inputs must necessarily move into the third world countries from the developed countries. But for participation to really work those who intend to change the people must allow the people themselves to plan, execute and appraise the process along with them. In other words, people must have to participate effectively since "it is too easy to equate the act of participation with the compliant behaviour of people adopting recommended practices rather than with the a priori involvement of people in information exchange leading to their helping to decide which set of practices is most fitting for them to adopt," (Ascroft & Masilela, 1994, p.259). This is because participation could be taken to mean any of the following:

- i. participation in decision making.
- ii. participation in implementation.
- iii. participation in evaluation, and
- iv. participation in receiving benefit (Uphoff, 1985. in Inagaki, 2007, p.8).

According to Ascroft and Masilela (1994, p 261), "what is required in participation is information exchange leading to mutually satisfying development decisions taken by people whose influence is equally weighted". It is in the light of this position that third world scholars have insisted on genuine participation, involving communication and development. According to McKee (1992), participatory initiatives less than participation in decision making by communities and non-experts are participation in disguise only and thus promote false participation, (McKee, in Inagaki, 2007, p.8). This paper is of the view that effective participation in community development can be better achieved through Community

Development Associations because they know where the

DISCUSSION In considering the utilization of Community Development Associations as instruments of rapid community development, it is imperative to factor into the Nigerian blueprint of focusing on cooperatives our citizens' mentality towards credit facilities especially those coming from the government as many Nigerians regard such credit as part of their own share of the 'national cake.' They rush to access such credit when readily available but are not only unwilling to apply the accessed funds to expected projects but are also reluctant to pay back the credit unless the credit collectors work very hard and apply harsh measures to ensure conformity. This has been the fate of loan facilities extended to people by National Directorate of Employment, FEAP and Agriculture Banks. It is therefore the considered opinion of this paper that, unless properly managed, this dysfunctional attitude could scuttle the intentions of government at rural development.

Profile of community development associations

Community Development Associations are catalysts for development. They are sociological groupings formed by different levels of consanguinity relations such as family, village, clan and larger ethnic groups. Outside this group, we have the modern convenient political arrangements demarcated as development associations by States, such as Lagos. These are composed of inhabitants living in close settlements, localities and neighbourhoods who may have no blood relations apart from the geographical expression of living in proximity within the larger unit of a State or local government. In all, they are a group of community members engaged in planning and implementing development projects for their communities. [Anaeto, 2010:76]. According to Ode [2016:12] Community Development Associations are formal and community-based, social, non-profit, non-guild organizations formed to fill the gap of inadequate development efforts in localities. CDAs also, assist in

Community Development Associations in Benue State

CDAs in Benue are more of primary sociological groups and there are generally over a thousand community-based associations in the State ranging from cooperatives of various guilds (which are dynamic and growing especially in view of Federal and State

shoe of development of their communities' pinches most.

Furthermore, since cooperative societies work for the narrow interest of their members, they cannot, therefore, in the Nigerian situation, be any guaranteed correlation between cooperative members' prosperity and that of providing development dividends across the country's communities. In other words, members of cooperatives might prosper individually but the availability of such dividends of development like good roads, standard and affordable health facilities, electricity and educational facilities might still elude communities across the communities going by the trend and attitude of wealthy Nigerians over time.

On account of this possible negative attribute of credit beneficiaries, the position of this paper is that for Benue State, community development associations, whose existence and pedigree outweighs that of cooperatives, be explored to widen and strengthen sustainable development partnership in the communities.

organizing people for self-help projects and mobilize them to participate in development activities. CDAs organize fund raising for development projects and complement government efforts in development. They link government and their people and act as forum for intra and intercommunity exchange of ideas. [Anaeto 2010:76-77].

CDAs are perceived by members of their communities as reliable and visible and as leaders in their community development process [Ode 2016]. They have been on the ground and in pursuit of community development for a long time. Because of their visibility/availability in the communities, they are obviously more aware of where the shoe of development pinches their communities. They, therefore, stand a better chance, especially in partnership with supra-local, State and other external agents of development with interest in their communities to be able to affect the development of their areas more positively.

governments' attention), women organizations to community development associations. There are however, four hundred and thirty (430) registered Community Development Association which have been formed and on ground for a long time in families, villages, clans and by entire ethnic nationalities. They are 147 of these in Zone A (Benue Northeast), 85 in

Zone B (Benue Central) and 250 associations in Benue South or Zone C [Ode, 2016]. Their existence and operations cover the entire communities in the State.

Each of these associations is organized and run by an executive of at least eight officials, operate through the instrumentality of constitutions and byelaws which regulate their activities as they plan and execute their programmes. Their activities include holding meetings to discuss their programmes and projects, identification of their felt needs, participation in their community development projects through supply of labour, contribution of money and materials [Akinsorotan and Olujide, 2006].

Elections are regularly held to elect officials to run the affairs of the associations. Thus, these organizations also operate under democratic principles and by election and membership, every sector of the community within which CDAs operate is represented. A study by Ode [2016] has also found that majority of members and piloting executives are literate with literacy ranging from primary school to post-graduate education. Education enables them to understand issues and discuss them better.

Furthermore, most of these organizations have branches in urban areas across the country with solid foothold in their communities of origin. These qualities predispose them to widespread consultation, effective appreciation of issues of development that arise from time to time in the communities as well as ability to partner with agencies of development that might be interested in the development of their communities. According to the United Kingdom Standing Conference on development: Community development is about active involvement of people in the issues that affect their lives. It is a process based on sharing power, skills, knowledge and experience; community development seeks to enable individuals and communities to grow and change according to their needs and priorities, and at their own pace, ... It claims as important the ability of people to act together to influence the social, economic, political and environmental issues which affect them. Community development aims to encourage sharing and to create structures that give genuine participation and involvement. <http://www.wordcat.org/oci/1981.5003>)

In a nutshell this is the power and position of CDAs as veritable partnership organizations for diversified development, Conscious of the limited reach of their

efforts, most CDAs in the State had built into their constitutions, partnership clauses. For example, the Constitution of Ameka-Owo Development Association (a village-based community association) has the following aims and objectives.

(i) to plan and embark on self-development projects where and when possible. The Association shall also call on the Local, State and Federal Governments of Nigeria for help where our resources are inadequate. To work in close relations with other associations at the local government level and Statewide in the realization of their objectives.

The Constitution of Omi Ny'Igede [2008], a larger ethnic organization covering Igede people in Oju and Obi Local Government Areas with branches throughout Nigerian towns, built in the following:

Being a socio cultural and economic organization, which is non-religious, non-political, non-partisan, the organization's aims and objectives shall be to foster the growth of national unity and progress of all Igede speaking people, and more especially.

(i) – to provide social amenities or infrastructures for the welfare and upliftment of Igede people in education, health, portable water like boreholes, urban wells, roads, and such other social infrastructures that may be beneficial to the well-being of our people generally

(vii) Solicit from the Federal, State and Local Governments, Ministries, Agencies or other NGO's assistance towards the socio-economic upliftment of our people.

Unfortunately, the articles on cooperation and synergy with governments and other NGOs have not been fully utilized for the socio-economic development of the State.

Therefore, and as Ode (2008 p.9) reported from 'a qualitative baseline study 'efforts to rank the indigenes of the State into rich, middle income and poor failed because international definition of poverty would certainly put both the middle income and the poor as poor and might as well include most of the rich in this category. Since the aggregate wellbeing of the individuals translate to that of the entire community, it is implied by this observation that Benue is poor and underdeveloped. For which something positive must be done.

Igirgi (2010), a onetime Commissioner with the State Government, supports the position and corroborates the above opinion and attributes the situation to

- i. Systematic neglect of the state by succeeding governments.
- ii. Non-focused programme of development.
- iii. Low budgetary provision for development.
- iv. People's orientation toward development
- v. Weak partnership with development partners

Igirgi [2010], Despite this, CDAs in Benue State have remained in the vanguard of providing some of the needed basic development infrastructure for their people [Okpaga, 2013].

Some of their functions include:

Problems of Community Development Associations

The operational potentials of CDAs notwithstanding, there is need to foster closer ties with government and other development agencies to increase their visibility and viability as community-based leaders in development and to increase their capacity to deliver on development infrastructure.

The following are some of the problems militating against enhanced performance of CDAs on development of the communities.

- (i) absence of tangible, robust external support. Where any support exists at all, it is with disinterest. There is no close attention to the activities of CDA to find out if given support is sufficient, directed at what was needed or misapplied.
- (ii) Paucity of funds for executing planned projects – this delays project execution or leads to outright abandonment of the projects.
- (iii) Apart from registering and providing certificates of registration, government agencies take no further interest in the operations of the CDAs. There is no interaction to monitor their survival, management and achievements.

Need for Management Participatory development has been advocated as the best practice for enhanced and sustainable development in rural areas [Ferari 2004, Uphoff 1985]. Development comes faster to people where community members are involved in the development programmes [Orji-Egwu 2012 p. 102].

- i. assisting in organising the people of their community to embark on self-help projects.
- ii. mobilising members to participate in development programmes of the community.
- iii. organising fund raising programmes to generate funds for community projects.
- iv. complementing government's efforts in the development of the communities'
- v. acting as link between government agents (and other change agents) responsible for community development and community members.
- vi. providing a forum for inter-communal interactions to promote exchange of ideas for socio-economic development of the community.

(iv) Fluid membership and participation in meetings. While all members of communities of CDAs are qualified to be members of the associations, participation at meetings is not done by all. Thus, only a handful of members attend and deliberate on issues. A wider spectrum of attendance could lead to more incisive deliberations and far-reaching decisions on development issues. Fluid membership also makes it difficult to measure their strength and capability.

(v) Limited synergy with other development partners and associations [Igirgi 2008]. A few CDAs have benefited from contact with foreign Development agencies (Das), and government agencies. If governments show interest in the activities of these CDAs, they could be better guided as to how to obtain assistance from diverse and willing development supporters.

(vi) The activities of elite or ambitious captors who often take over leadership and use CDAs to pursue selfish personal interests which might be political or economic. If those willing to partner with CDAs monitor them closely, these factors could be prevented to enable the organizations direct their energies to community development issues.

Management has to do with a directed application of resources for attaining sated organizational goals. CDA officials have been managing their organizations as much as their capacity could allow. However, in development activities worldwide, emphasis has shifted to participation. "In participatory development, the key elements of the process: decision making/planning,

implementation, evaluation and receiving benefits, are usually recommended to be shared and undertaken by those coming with development programmes and members of benefiting communities.” [Uphoff, 1985, in Inagaki 2007]. It has been said that effective partnership between supra ‘local, local and community institutional structures have led to institutional changes resulting to increased rate of rural development in Korea, Taiwan, China and other Asian countries. [Guypta, Grandvoiment & Romani 2003:1]. Yahaya [2003] on the other hand has reported that the close and multifaceted collaboration between the apparatus of state and community leaders became important factors in the development of the Asian countries. CDAs are therefore the ready apparatus of cooperation for desired sustainable growth.

Conclusion

In that wise governments in the State are required to do the following for effective management of the CDAs: -

- create CDA desks in relevant ministries [Ode, 2016]
- Conduct annual audit of CDA activities to locate viable ones and encourage the weak.
- Development information for communities should be discussed and channeled through CDA executives in the spirit of participatory decision making.

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Participatory development theory supports the management and synergy of supra local, local and community organizations for better development results. The theory, developed from the writings of Paulo Ferari of Brazil [1970] Uphoff and others have celebrated the fact that participation is effective when beneficiaries of development initiatives are behind the steering wheel of development. Already CDAs have been driving but the necessary skills to manipulate the vehicle of development faster, for long distances and to diverse development destinations is limited. External development agents need to sit by the CDAs on the driving seat, as partners, to guide and support them to remove the stress and get them further along the development drive.

- Hold periodic conference of CDAs with other development agencies to appraise CDA activities, challenges and share relevant information.
- Development infrastructure for communities and in communities should be discussed with CDA executive officers before execution to remove possible obstacles to their implementation [Mainer 2000]
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MITIGATING THREATS ISSUED TO LIFE AND PROPERTIES BY GAS LEAKAGE DETECTION SYSTEM

IKE INNOCENT

email: centobaba80@gmail.com

DR. KARIM USMAN

email: kusman@bsum.edu.ng

HARUNA ZAKARI

email: zacks.haruna@gmail.com

Department of Computer Science Nigerian Army College of Environmental Science and
Technology Nasme Makurdi, Benue State.

Abstract

A smoke detector is a device that senses smoke. Smoke detector response based on optical density, temperature rise, and gas velocity thresholds. The purpose of this study was to assess the uncertainty associated with these estimation methods. Experimental data was used to evaluate recommended alarm thresholds and to quantify the associated error. With few exceptions, less than 50 percent of the predicted alarm times occurred within ± 60 seconds of the experimental alarms. At best, errors of 20 to 60 percent (in under-prediction) occurred for smouldering fires using an optical density threshold. For flaming fires, errors in predicted alarm times on the order of 100 to 1000 percent in over-prediction of the experimental alarms were common. Great care must be exercised when applying these approximation methods to ensure that the uncertainty in the predicted alarm times is appropriately considered.

Keyword: Notification, GSM, Leakage, Security, Sensor, Microcontroller, Buzzer, Arduino Uno, Adapter, Module, MQ-5, Notification, Combustible, Potentiometer and Photovoltaic.

INTRODUCTION

Security is the extent of protection against danger, damage, loss and crime. Security as a form of protection which includes structures and processes that provide or improve security as a condition. Security systems, hence, monitor the state of a property and access of persons unto and around the property. Gas leakage has been a major problem with industrial sector, residential premises and gas powered vehicles like compressed natural gas buses, cars. Due to leakage of gas, it produces hazardous and toxic impact for human beings and also for other living creatures.

A gas leakage alarm system is a device that detects the presence of gases in an area, often as part of a safety system. This kind of system is used to detect a gas leak or other emissions and can interface with a control system so a process can be automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to detect the leakage for security reasons and make

choices on what to do afterward. This device is important because there are many gases that can be harmful to organic life, such as humans or animals (Steve, 2003).

Gas leakage alarm system can be used to detect combustible, flammable and toxic gases, and oxygen depletion. This type of device is used widely in industry and can be found in locations, such as on oil rigs, to monitor manufacture processes and emerging technologies such as photovoltaic. They may be used in firefighting.

Gas leak detection is the process of identifying potentially hazardous gas leaks by sensors. These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected. Exposure to toxic gases can also occur in operations such as painting, fumigation, fuel filling, construction, excavation of contaminated soils, landfill operations, entering confined spaces, etc. Common sensors include combustible gas sensors, photoionization detectors, infrared point sensors, ultrasonic sensors, electrochemical gas sensors, and

semiconductor sensors. More recently, infrared imaging sensors have come into use. All of these sensors are used for a wide range of applications and can be found in industrial plants, refineries, pharmaceutical manufacturing, fumigation facilities, paper pulp mills, aircraft and ship-building facilities, hazmat operations, waste-water treatment facilities, vehicles, indoor air quality testing and homes. However, in this work a special gas sensor called MQ-5 sensor module will be used for the design.

The importance to design a global system for mobile communication based gas leakage alarm system is to have a more independent device which when it detects any smell of gas, it will send an alert to the home owner

Related Work

Gas detector a gas detector is a device that detect the presence of gas in an area, often as a part of safety system. It is used to detect gas leak or other emission and

Different types of gas detectors

Electrochemical: This type of gas detector work by allowing gases to diffused through a porous membrane to an electrode where it is either chemically oxidised or reduced.

Catalytic bead: These sensors are commonly used to measure combustible gases that present in explosion hazards when concentrations are in lower explosion limit (LEL,) and upper explosion limit (UEL).

Photo-ionization: Photo- ionizations detectors (PIDS) use a high-photon-energy UV lamp to ionize chemicals in simple gas. If the compound has ionization energy below that of the lamp photons an electron will be ejected and the resulting current will be proportional to the concentration of the compound.

Infrared point: Infrared (IR) point sensors use radiation passing through a known volume of gas; energy from the sensor beam is absorbed at certain wavelengths, depending on the properties of the specific gas. For example, carbon monoxide absorbs wavelengths of about 4.2-4.5 μm . The energy in this wavelength is compared to a wavelength outside of the absorption range; the

Arduino Uno: This is an open source platform used for building electronics projects. It is a physical programmable circuit board often referred to as

and also signal to the buzzer and timer will set time for period to trigger the alarm. (Mior, 2009).

Disasters cause by gas explosion in different places today is mind blowing, industries, homes and offices that uses gas products including environment where gases are situated encountered a whole lot of threats cause by broken pipes, cylinder explosion, and fire outbreak among others. Due to leakage of gas, it produces hazardous and toxic impact for human beings and also for other living creatures. These research work will be a device used to mitigate the threats issued to life and properties by providing a platform where gas can be detected automatically without human aid.

can interface with a control system so a process can automatically shut down. A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them opportunity to alert.

difference in energy between these two wavelengths is proportional to the concentration of gas present.

Infrared imaging: Infrared image sensors include active and passive systems. For active sensing, IR imaging sensors typically scan a laser across the field of view of a scene and look for backscattered light at the absorption line wavelength of a specific target gas.

Semiconductor: Semiconductor sensors detect gases by a chemical reaction that takes place when the gas comes in direct contact with the sensor. Tin dioxide is the most common material used in semiconductor sensors, and the electrical resistance in the sensor is decreased when it comes in contact with the monitored gas. The resistance of the tin dioxide is typically around 50 k Ω in air but can drop to around 3.5 k Ω in the presence of 1% methane. This change in resistance is used to calculate the gas concentration.

Ultrasonic: Ultrasonic gas leak detectors are not gas detectors. It detects the acoustic emission created when a pressured gas expands in a low pressure area through a small orifice (the leak).

microcontroller and Integrated Development Environment (IDE) used to write and upload computer code to the physical board.

1. Arduino (microcontroller): is a prototype platform (open source) based on an easy to use hardware and software. It consists of a circuit board, which can be

programmed and readymade software called Integrated Development Environment (IDE), which is used to write and upload the computer code to the physical board.

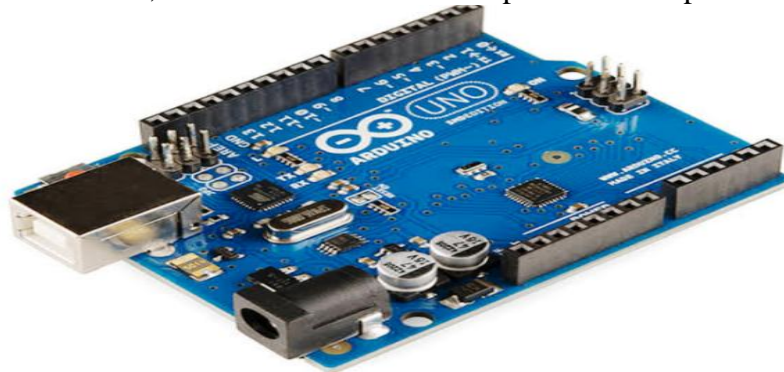


Fig 3.6.1 Arduino Uno

Buzzer is a device that sounds; specifically an electronic signaling device that makes sounds (buzzing). A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse

click or keystroke Such buzzers are used in gas alarms, burglar alarms, etc. In this detector the buzzer gives the output sound when the LPG gas is detected by the sensor. So the buzzer serves as the audio output of the detector. (Kwon Et al 2008).



Figure 3.6.4 the block diagram Buzzer

Microcontroller for developing a software environment for writing program for the board. The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as pulse width modulation outputs), 6 analog inputs, a 16 MHz crystal oscillator, a universal serial bus connection, a power jack, an In-circuit serial programing header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a

universal serial bus cable or power it with a Alternating current-to- Direct current adapter or battery to get started. UNO Microcontroller is programmed using an Arduino Integrated Environment or rather Arduino Software [Integrated development environment]. This Integrated development environment helps in writing an instruction code for the Arduino. Arduino can interact with buttons, light emitted diodes, motors, speakers, global positioning system units, cameras, the internet, and even your smart-phone or television!

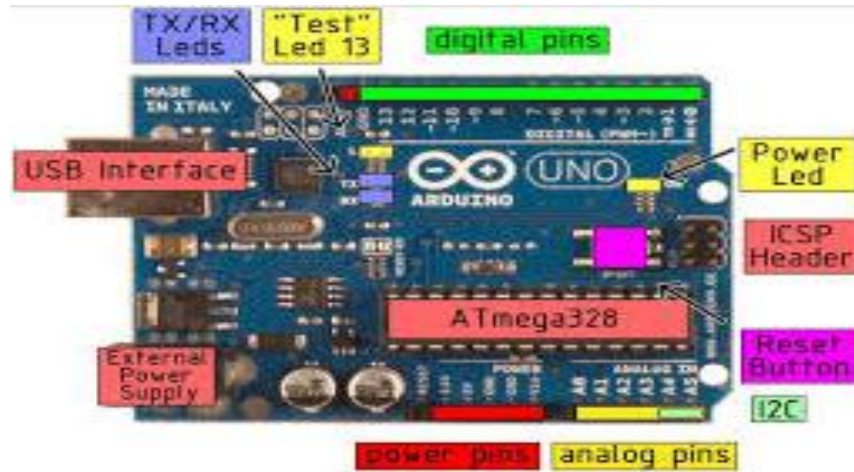


Figure 3.6.2 the block diagram of microcontroller.

Alarm system: An alarm system is a device designed to detect intrusion, such as unauthorized entering into an area or place such as schools homes etc. It is a device or series of devices which emits or transmit an audible or remote visual or electronic alarm signal which is intended for security purpose.

G S M Notification; These is the use of Global system for mobile communication to signal various events by short message system and calling.

Ways of Notification; S M S are sent using either the standard GSM – based SMS or gate –way SMS module use to signal various events by sending short messages and calling (Kaveeya 2020)

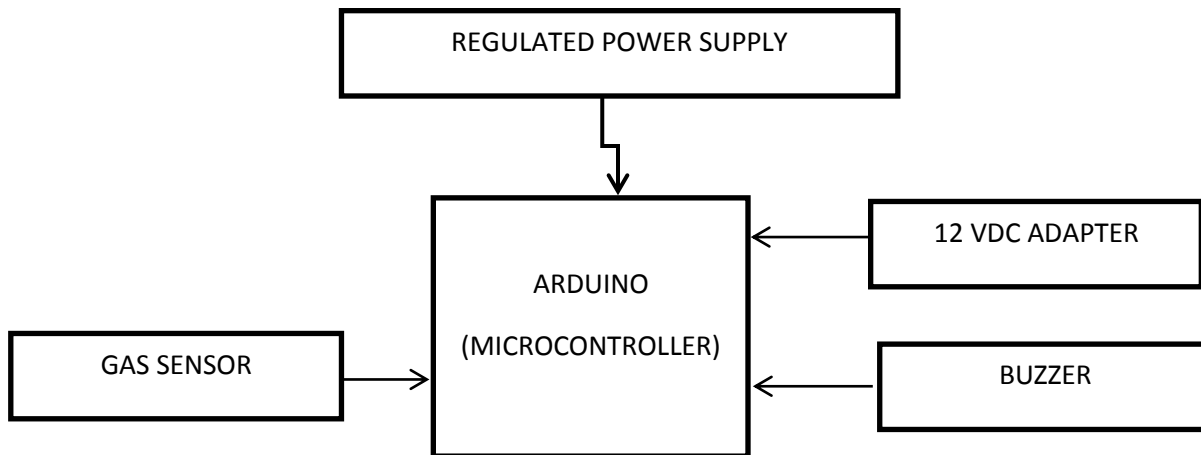
Arduino: The Arduino is fed a 9v from a power source which it then converts to its operating voltage of 5v. It decodes the signal received from the 12 VDC adapter via

the sensor. The Arduino instructs the buzzer based on the signal to drive the sensor. The sensor in turn pulls the load. The mechanical components that were used to carry out the design and construction on a gas alarm system using GSM notification is the case used as a cover.

Main Focus The main focus is to design and construct gas sensors using Arduino microcontroller. Arduino is a microcontroller by which many instruments can be made; from these, the “Gas sensor” will be made. In this authentic model a gas sensor model i.e. MQ-5 gas sensor is used for sensing LPG gas from environment and allows user to be aware of the leakage of that. For being aware a buzzer is used to be aware of and interrupt the user to the hazards of the consumption of the destruction of gas leaking. This module will effective to detect LPG leakage in domestic purpose, factory, petrol pump etc.

System Architecture

1.



Microcontroller System Architecture for smoke detection

RESULTS AND DISCUSSION

Construction Procedure and Testing

In building this project, the following procedures were properly considered,

- i. Proposing of the entire materials / Components needed
- ii. Resistance check of the components bought with the help of ohmmeter before making the necessary connection with the components
- iii. Drafting out a schematic diagram or how to arrange the materials / components.

Design principle:

Casing and Packaging

The casing of this research comprises of internal and external packaging. Internal parts of the circuit was

Assembling of Sections

Having provided the casing and having finished the construction of the sections of this system, the assembling into the casing followed. The sections were properly laid out and assembled into the casing where the general coupling and linkages into the peripheral devices took place.

Testing of System Operation

In this stage, the system was due for testing and operation. The system operation was tested where all its required performance was maintained.

First; the device was connected and switch ON with the toggle switch, then the system is set for operation. The indicator light is also connected whose function is mainly to indicate the presence of power supply into the system.

During testing, a 12VDC adapter was used, in other to see it efficiency, accuracy and threshold and fortunately the goal was achieved correctly.

Problem Encountered As we all know that every engineering work goes with one or more problem, which enhances research and probably technological advancement to engineers while endeavoring to resolve such problem. Therefore the project on discussion suffers some noticeable drawback, which includes:

Mechanical problem: We found it difficult to install all the external components. But after the effort was made,

iv. Testing the completed system to see if the design works and

v. Finally, implementation of design of the project.

Having procured all the materials, we processed into the arrangement of the components into the Vero board, proper soldering of the components then followed. The components were all soldered into the board after which it was correctly confirmed done.

soldered and fixed inside the case. Then after that, follow by external components such as indicators, LCD and switch.

Finally; the indicator, switch were carefully brought out from the internal part of the casing through the holes made on the body of the casing, the input cable plug outlet mounted on the body of the casing where power source terminals will be connected to.

my aim was later achieved. We found it difficult to select the right gas sensor that will be used to control the sensation of gas in residential settlement, offices and oil rigs as the case may be.

Maintenance

Hardware maintenance is the testing and cleaning of equipment. Software maintenance is the updating of operating systems and application programs in order to add new functions and change data formats. It also includes fixing bugs and adapting the software to new hardware devices. In the maintenance literature it is generally recognized that maintenance can be grouped into three categories:

1. Corrective maintenance: Maintenance tasks are intentionally withheld until an asset stops working or starts failing. Maintenance is the performance as necessitated.

2. Preventive Maintenance: Maintenance tasks are performed at regular intervals, based on industry expected equipment life spans and failure patterns.

3. Predictive Maintenance: Maintenance is conducted only when it is confirmed necessary through the use of **Construction procedures photos**

It is a step by step approach in construction and design in order to achieve the mechanical hardware that can be

non-destructive tests that detect failure conditions before their occurrence.

used to load the software program which can actually do the job of gas alarm using GSM notification; below are the figures.

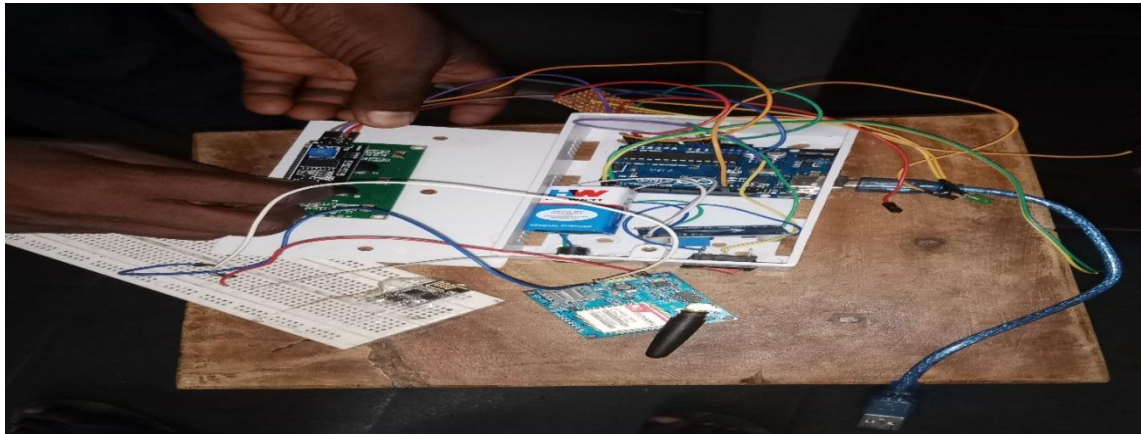


Figure 4.1 interfacing the different electronic components using breadboard

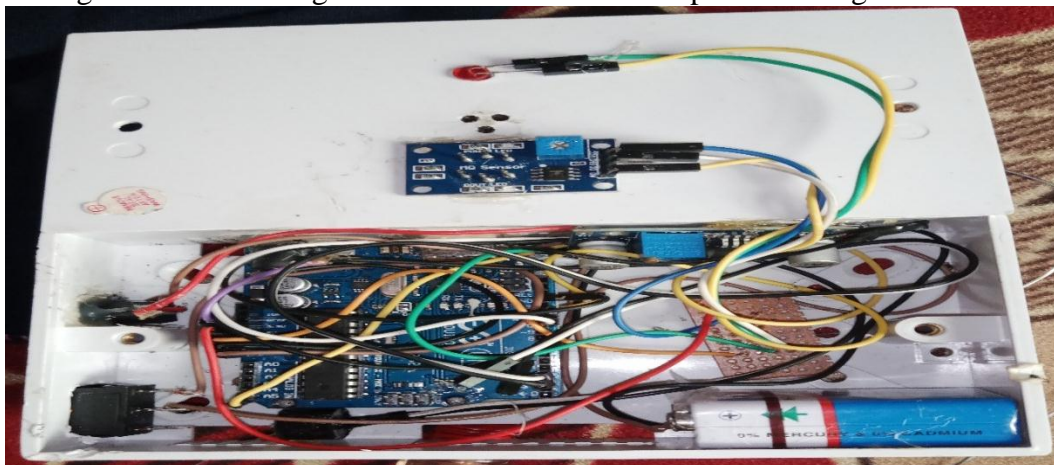


Figure 4.2 implementing the functional interfaced devices on the parterres for testing and confirmation

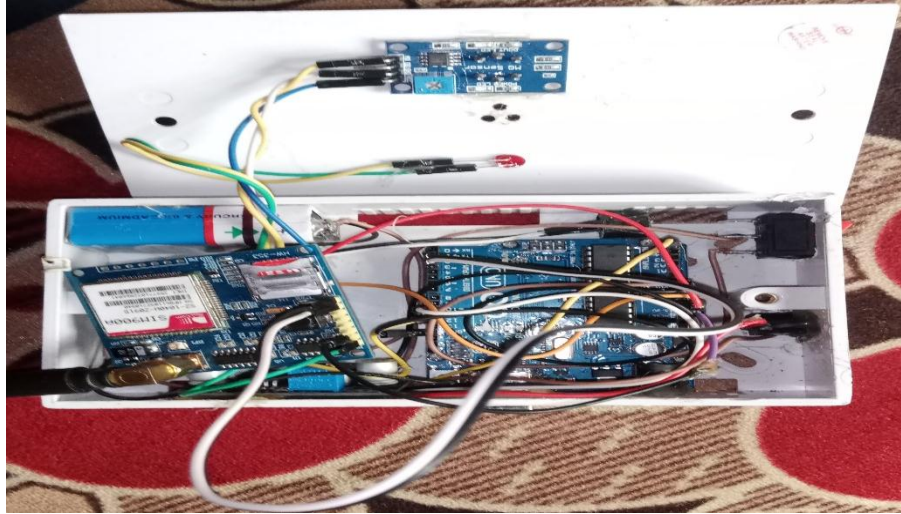


Figure 4.3 integrating GSM module with other devices to implement SMS notification

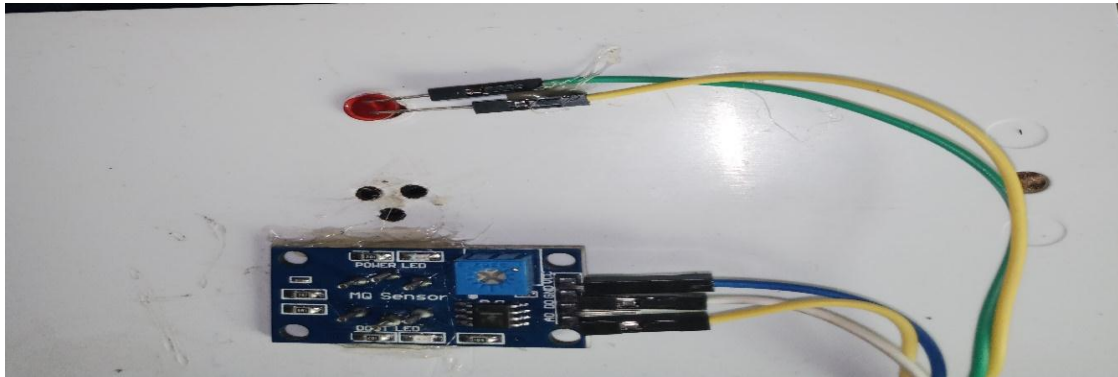


Figure 4.4 addition of MQ-5 gas sensor and LED indicator to the entire circuit

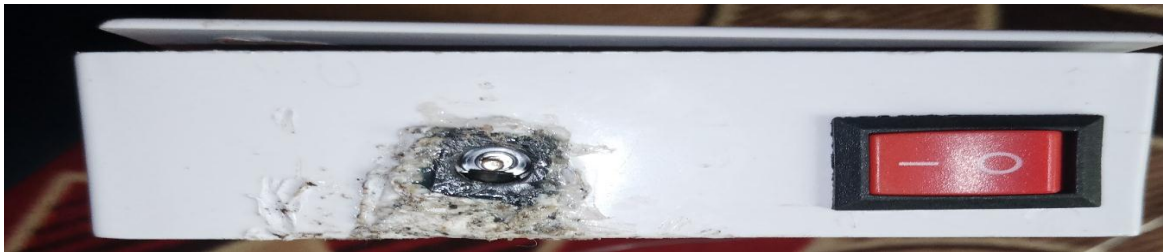


Figure 4.5 connection of switch and adapter port for powering the arduino microcontroller board



Figure 4.6 creating access point for microcontroller port for easy access to load program via universal serial port

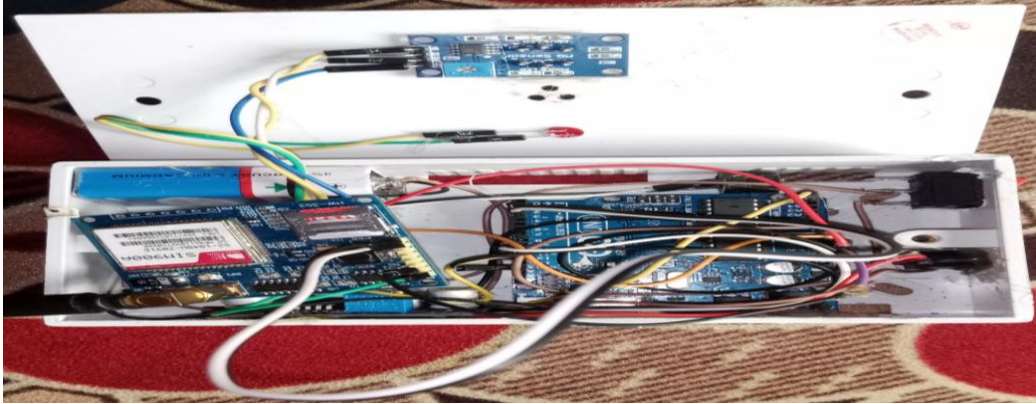


Figure 4.7 all electronic devices are completely interfaced ready for testing



Figure 4.8 complete gas leakage detector device ready and encased in a parterres



Figure 4.9 functional gas detector with mobile phone receiving short messages service signal via GSM module

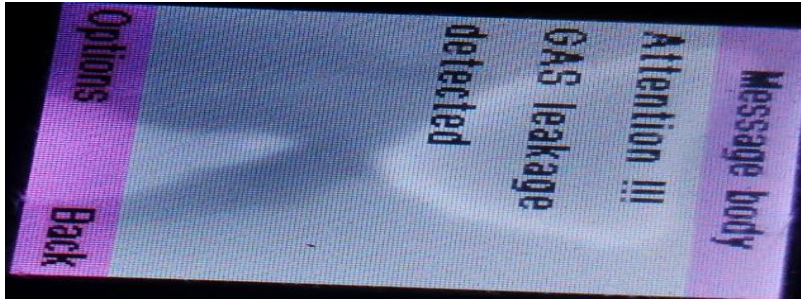


Figure 4.10 mobile phone displaying message sent from the gas detection device via SMS

Conclusion and Future Work

Conclusively, This Research Work was aimed construction of gas leakage alarm using GSM notification, for monitored use of gas only. It was achieved using cost effective materials. It is capable of increasing a sense of security because it can only be

Conclusion

This paper addressed the construction of gas leakage alarm using GSM notification that receives the input from sensors and delivers it to the microcontroller. The microcontroller in turn instructs the gas sensor to trigger the buzzer and GSM module to alert user about the leakage of gas in a given environment where it is installed. This type of gas detector ensures high security, easy operation and reduced cost. Gas leakage alarm system is a self-dependent system and it does not need to

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operational at the push of a power button to ON and it commence sensing and saves cost. It attempts to proffer a lasting solution to the long-lingered difficulties and inconveniences with gas usage in an unprecedented manner.

be operated manually. It is found to be very useful in life when developed appropriately.

The following are recommended for further research: Manual operation in case of power failure: You can quickly and easily switch the device from electric to emergency operation. Using powerful sensors to increase effective distance from 5 meters above. AC current and DC current can be used to eradicate the problem of power failure.

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THE ROLE OF TECHNOLOGY TOWARDS ECONOMIC GROWTH AND NATIONAL DEVELOPMENT; THE ESTATE SURVEYOR AND VALUER'S PERSPECTIVE

MURTALA MOHAMMED

Department of Estate Management and Valuation, Nigerian Army College of Environmental Science and Technology (NACEST), Makurdi.

email: murtalamohammed716@yahoo.com, Phone: +2348078876078

Abstract

Estate surveyors and Valuers are professionals who are well trained in the field of land and landed properties and so stands a better position to advice government on any matter related to land. This Paper examines the role of an Estate Surveyors and Valuer towards Economic growth and development of Nigeria. Furthermore, it impacts directly on the economic opportunities through built environment and other areas of investment available in Nigeria. Thereafter, contributions of Estate Surveyors and Valuers to economic growth and development in Nigeria potentials are discussed. The study recommends that the employment of skills of appropriate professionals is critical to the success of any Nation. It was also recommended that government should harness other source of revenue other than mineral oil whose price in the International market is not reliable. Finally, it was recommended that government should embark on property taxes which is regarded as chief sources of government revenue at all level. Conclusively, Real Estate Development can serve as a springboard for the transformation of Nigerian economy and the role of an Estate Surveyors and Valuers in the economic growth and development of Nigeria cannot be over-emphasized.

Keywords: Estate, Management, Value, Land, Property, Estate Surveyors and Valuers.

1.0 INTRODUCTION

Technology is the scientific knowledge used in practical ways in Industry. Real Estate professionals are products of technology. Real Estate development provides a hallmark for nation's economic growth and development. It brings other sectors of the economy through tremendous multiplier effect. Furthermore, it impacts directly on the immediate environment through multiplicity of job creation, increase the purchasing power of locals at the construction stage, stimulates growth and development of subsidiaries, releases funds for further developments and investments, attracts capital inflow into the nation's economy, hence, contributing to the nation's Gross Domestic Product (GDP) (Fuller, 2005). Real Estate Investment therefore

provides a springboard for the development of other sectors of a nation's economy.

However, the choice of location for real estate development, the feasibility and viability of the project in question, the design, the compatibility of use and activities, the management of the completed development are critical factors in real estate development process. More so, the employment of skills of appropriate professions in the built environment with special emphasis to Estate Surveyors and Valuers who are needed at the conceptualization of the development, sourcing of finance for development (project coordination) through his requisite skills and linkage with finance houses, manages or disposes the property after completion among other things is fundamental to the success of real estate development.

2.0 TECHNOLOGY, ECONOMIC GROWTH AND DEVELOPMENT

Technology is the scientific knowledge used in practical ways in Industry (Hornby, 2001). Economic growth and national development is concerned with an increase in economic activity and standard of living of the masses.

(Anyanwuocha, 2010). Economic growth is the process by which national output is increase. An economy is said to be growing if there is a sustained increase in the actual output of goods and services per head. The rate of economic growth therefore measures increase in real national income, during a given period of time, usually a

year. National development on the other hand is the process of increasing real per capital income and engineering substantial positive transformations in the various sectors of the economy.

Furthermore, with economic development, there are structural transformations in the different sectors of the economy as well as general improvement in various areas of economic activity and different areas of the Country, leading to increased economic welfare of the citizens. In a nutshell, economic growth emphasizes on increase in output while national development bothers on

2.1 NATURE OF NIGERIAN/DEVELOPING ECONOMY

The word “developing” and “underdeveloped” are used to mean the same thing. Developing and underdeveloped nations are used to describe economies that have not reached a certain level of development in terms of structural transformations and improvements. An underdeveloped economy has the following features;

Low Level of Technology

Much production done in Nigeria is by using primitive methods of production. In the built environment the use of quacks is widespread while the use of the professionals is limited.

Poorly Developed Infrastructure

Basic facilities/municipal infrastructure such as electricity, roads, communication networks, health centers, sewage and sewerages, water supply, education

3.0 THE NIGERIAN INSTITUTION OF ESTATE SURVEYORS AND VALUERS

The Nigerian Institutions of Estate Surveyors and Valuers is a non-profit, voluntary, professional organization set up in 1969 to cater for the interest of the landed profession in Nigeria. The Institution was accorded official government recognition six years later by the promulgation of the Estate Surveyors and Valuers The Decree defines the profession of estate surveying and valuation as the art, science and practice of;

- (a) Determining the value of all description of property and of the various interests therein.
- (b) Managing and Developing Estates and other business concerned with management of landed property.
- (c) Securing the optimal use of land and its associated resources to meet social and economic needs.

improvement in the general welfare due to a more equitable distribution of the increases output of goods and services between individuals.

Economic growth can take place under conditions of mass unemployment while national development implies a reduction in the level of unemployment. If increased output is concentrated in the hands of few or made up of such things as official cars to top government officials rather than basic food and housing the masses are not better off and no meaningful national development has taken place.

and a host of others which are essential for an industrial take off are poorly developed.

Low Savings

Majority of the population spend large proportion of their income on food, house rent and clothing which is essential in life with little or nothing left for investment.

High Degree of Unemployment and Under-employment

The available job opportunities are highly insufficient for all those who wish to work. So many people are left unemployed.

Low Income Per Capita

The low level of income per head of the population is due to low level of productivity which results in low national income or Gross Domestic Product. When the total Gross domestic product is spread among the population, the share of each person is small. A low level of income per capita leads to low standards of living.

Registration Act (see Laws of Nigeria 1990, Volume 7, Chapter 111), which is more popularly known as Decree No. 24 of 1975.

However, the above legislation established the Estate surveyors and valuers Registration Board of Nigeria (ESVARBON) as a cooperate body empowered to regulate the profession of Estate Surveying and valuation in Nigeria.

- (d) Determining the structure and condition of buildings and their services before advising on their maintenance, alteration and improvements;
- (e) Determining the economic use of land resources by means of financial appraisal for the building industry; and
- (f) Selling (whether by auction or otherwise buying or letting (as an agent) of real and personal property and of any interest therein.

3.1 THE ROLES OF AN ESTATE SURVEYORS AND VALUERS IN THE ECONOMIC GROWTH AND DEVELOPMENT OF NIGERIA.

The profession Estate Surveying and Valuation play a vital role in the economic growth and development of the current administration in the following ways;

VALUATION

Valuation is the science and art of estimating the worth of an assets in monetary terms either movable or immovable at a particular date for a specific purposes having regard with the peculiarity of that property such as size, age, construction details, location, developments or improvements, facilities etc.

Role of Valuation in the Society

Valuation is the responsibility of the members of the Nigerian Institution of Estate Surveyors and Valuers who are registered with the Estate Surveyors and Valuers Registration Board of Nigeria (ESVABON) and so certify by law of the Federal Republic of Nigeria to produce valuation report regarding all economic transactions in Nigeria. However, the valuation report produce are used for the following purposes; Insurance, Mortgage, Balance sheet, Compensation against compulsory purchase, among other things.

FINANCING LAND DEVELOPMENT

Estate Surveyors and Valuers provide advice to developers in respect of financing all form of land development. There are several sources of financing development such as sales and leaseback arrangement, mortgage, equity participation, communal contributions etc.

FEASIBILITY AND VIABILITY STUDIES

Feasibility and Viability studies is an act of orthodox valuation known as pre-investment study and it avoid while elephant syndrome (problems of uncompleted project). In order to avoid problem of abandoned projects which is a threat to economic growth through discouragement of foreign investors, reduction on income level etc. The services of an Estate surveyors and Valuers who are expert on feasibility and viability appraisal is necessary.

Insurance: This is a cover an individual or organization can get to extirpate him/ them from loss or damage of the property by paying certain form of money as prescribed by the insurer. In order to avoid over-insurance or under-insurance, valuation is necessary.

Mortgage: Landed property is normally used as security for loan. With this arrangement, the borrower or property owner (mortgagor) will transfer his interest in property to the lender (The mortgagee). The services of an Estate surveyors and Valuer is needed to determine the mortgage value in order to avoid over-payment or under-payment of mortgage loan.

Balance sheet: This is a financial statement showing assets of a company usually at the end/beginning of each year. The assets side of the balance sheet normally reflects the values of fixed assets in which land and landed property is included. However, to convert these fixed assets (Land and landed property) a valuer need to do a job.

Compensation on Compulsory purchase: Public authorities are normally vested with the power to acquire private land for public purposes and compensation is paid to the holder. In order to arrive at compensation payable, Valuation is necessary.

FACILITY MANAGEMENT

Facilities management is the integrated management of the workplace to enhance the performance of an organization (Tai & Ooi, 2001). It is concerned with the coordination of the workplace, people of an organization and the work of an organization. An Estate Surveyors and Valuers who is a trained expert in facilities management is to ensure good environment, value for money, effective and efficient use of space, well-motivated workplace, workers self-expression, good relationship among workers and their employers etc.

ARBITRATION AND SERVICES

Arbitration is the process where disputant appoint Arbitrator(s) to hear their evidence and decide the dispute for them (Kelvin, 2001). An Estate Surveyors and Valuers who is trained in the field of arbitration is to

settle disputes that may arise between disputing parties and also advice government on any matters related to land.

DEBT RECOVERY SERVICES

Real Estate has been the best security for loan. Estate Surveyors and Valuers provides advisory services to both lenders and borrowers on the value of their property for mortgage purpose. In the same vain, they help in the recovery of the mortgage property through revaluation.

PROPERTY MANAGEMENT

Property Management is the most difficult aspects of Estate Management. Property assets such as land and

4.0 CONCLUSION

Real estate development provides a hallmark for nation's economic growth and development. Real estate Investment also provides a springboard for the development of other sectors of a nation economy. The employment of appropriate skills professionals in the built environment is fundamental to the success of real estate development. However, An Estate surveyors and Valuers plays vital role in the economic development of Nigeria some of which are: Valuation, feasibility and Viability Study, Facility Management, Debt recovery services etc. Therefore, the role of an Estate Surveyors

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buildings are key resources for all types of organizations, within public sector organization, property can be considered as having financial contribution and effect upon annual financial statement, Assets base as well as resale values in case of privatization of any public entities. Therefore, property resource in the same way as human, financial and information resources contribute to the success of any organization and need to be effectively and efficiently managed. Effective property management deliver quality services to its end-users. An Estate surveyor and Valuer who is a property manager ensure effective and efficient property management.

and Valuers in the economic development of Nigeria cannot be over-emphasized.

5.0 RECOMMENDATIONS

1. In order to achieve economic growth and national development in Nigeria, the employment of professionals from built environment is critical.
2. Government should harness other sources of revenue other than mineral oil whose price in the International market is not reliable, which makes difficult for government to budget on it
3. As a matter of fact, government should ensure that, the right professionals are put in a right place in order to achieve any government programme and policies.

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THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) IN THE DEVELOPMENT OF THE TEACHER OF ENGLISH LANGUAGE

EGBODIBO OJOH

Directorate of General Studies

Nigerian Army Institute of Technology and Environmental Studies

Makurdi, Nigeria.

email:ojohgbodibo@gmail.com

Abstract

In the past two decades, there has been a significant expansion in the availability of a wide range of technologies with the potential to improve the quality of teaching and learning English. Apart from the more traditional technologies such as print, broadcast television and radio, the following new technologies provide opportunities for enhancing the quality of teaching English: audiotapes, videotapes, computer-based learning packages, interactive video, audio-teleconferencing, audio-graphic communication systems and videoconferencing. In recent times, these technologies have been supplemented by the advent of the opportunities for interactivity and access to instructional resources provided by the computer communications networks popularly referred to as the "Internet". The trend is towards "technology-mediated" flexible learning. Indeed, learner behaviours have undergone major changes as a result of easier communication and interaction with other learners and teachers through the use of computers. The teacher of English Language must become conversant with the new technologies of information and communication to attain greater pedagogic efficiency.

INTRODUCTION

We suspect that the choice of theme for this conference is influenced largely by the introduction and level of ICT development in the universities and the challenges accruing thereof. The truth is that very few teachers of the English Language in and outside the universities are abreast with this development. While we are conscious of the sentiments associated with the use of English as the official national language in Nigeria, we hasten to make the point that more and more people are speaking, reading and writing in English now in Nigeria than ever before. It is estimated that about 60% of Nigerians use English or its varieties. It is also largely the medium of

instruction in our schools. Given the importance of English Language, therefore, the teacher of English should be adequately equipped to competently deliver quality instruction to the learner of English. What is the value of communication; what is the value of ICT in pedagogical communication? What is the level of competence of the teacher in ICT to deliver the pedagogical instruction? How do you measure competence when the teacher himself (himself used in the generic sense) lacks the competence and tools of tutelage to impart the requisite knowledge? Herein lies the thrust of our paper.

The Case for ICTs

The use of technology in education dates back into history. From a crude form in the early days of civilisation to the vast array of computer-technology driven devices of the 1990s, technology has significantly revolutionized educational theory and practice. In his book, *The Road Ahead*, Bill Gates of the Microsoft Corporation envisions a rather rapid transformation of

the educational delivery process and assessment of learning by the fast developing information highway. The dynamics of change and the flux in computer technology development have made Gates to conclude that the information superhighway will transform education in the first quarter of the 21st Century.

The communications revolution has had tremendous implications for education. This is because education involves the medium and message of the communicative process. The chosen medium of communication influences the distribution of knowledge over time and space. The technology involved in communicating has been linked to learning throughout history. From clay

In the past two decades, there has been a significant expansion in the availability of a wide range of technologies with the potential to improve the quality of teaching and learning English. Apart from the more traditional technologies such as print, broadcast television and radio, the following new technologies provide opportunities for enhancing the quality of teaching English: audiotapes, videotapes, computer-

Delivery technologies simply package information and instruction to give students access to educational experiences. What matters is the quality of the instructional message, rather than the inherent characteristics of the instructional medium used. The flexible access technologies allow the student to turn the teacher on or off at will, as lifestyle and time permit. Also, access to the Internet allows interactivity without sacrificing the benefits of flexible access, since it can be used to support asynchronous communication. Such flexibility has the pedagogic benefit of allowing students to progress at their pace. Thus the trend is towards “technology-mediated” flexible learning. Indeed, learner behaviours have undergone major changes as a result of easier communication and interaction with other learners and teachers through the use of computers. The teacher of English Language must become conversant with the new technologies of information and communication to

Re-tooling the Teacher of English Language in the Realm of ICTs

The emergence of Information and Communication Technologies (ICTs) has revolutionized the existence and activities of contemporary man especially in the ambience of globalisation and the new knowledge society. No sphere of human endeavour is insulated from the impact of these new technologies. Indeed, it is critical to national development. In tertiary education, contemporary developments have been catalysed by

tablets to paper and pen, chalkboard to books, pictures, radio and tape to television and films, the new educational technologies use the most sophisticated microelectronics and communication media. The range of new information technologies is diverse and includes microcomputer, the satellite and telematique (the merging of computer and telecommunications).

based learning packages, interactive video (disk and tape), CDTV, audio-teleconferencing, audio-graphic communication systems and videoconferencing. In recent times, these technologies have been supplemented by the advent of the opportunities for interactivity and access to instructional resources provided by the computer communications networks popularly referred to as the “Internet”.

attain greater pedagogic efficiency. The suggestion is that the pedagogic support of computer technology in teaching and management of English Language programmes especially in tertiary education will enhance the following:

- the visualisation of processes and procedures;
- diagnosis, that is self-testing as an exercise goes on;
- reflection, on acquisition and learning;
- creative writing simulation;
- the creation of situations, that is contextualization;
- autonomy;
- rhythm of work;
- motivation;
- group work;
- integrated knowledge; and
- access to learners from various social backgrounds.

ICTs. The global reforms in Education, particularly in response to the effects of globalization demand that any nation desirous of being a key player must be in the fore front in the application of ICTs to all its educational plans and processes. In consequence, educational institutions around the globe are under increasing pressure to use ICTs to teach their students the knowledge and skills they require to be key players in the competitive 21st Century. Integration of ICTs into teacher education will be greatly enhanced if students in

the programme are given the opportunity to experience innovative technology-supported learning environments in their teacher-training programme. This requires that students should see their teachers engaging in technology to present their lectures, for instance,

It is gratifying to note that the opportunity exists for re-tooling and improving the capacity of the teacher of English Language in the Nigerian tertiary education system in his tripartite functions of teaching, research and community service through the instrumentality of The Virtual Institute for Higher Education Pedagogy (VIHEP). VIHEP aims to provide academic staff in tertiary institutions in Nigeria, especially universities with Internet-based training on modern methods of teaching and learning in tertiary education. The scheme

The project will translate into the production of a new breed of university teachers that are able to deliver quality education to both local and foreign students.

Teacher development can also benefit immensely from the National Virtual (Digital) Library Project put in place in response to the widespread inadequacy of books and journals as well as the obsolescence of library holdings in the Nigerian university system. NUC introduced the National Virtual Library Project with its hub at the NUC in 2002. Servicing university based digital libraries will enable scholars and students in Nigeria and from other parts of the world to have access to the following resources:

Although the project will initially focus on universities, it will eventually connect the polytechnics, colleges of education, secondary and primary schools.

Conclusion

In this paper, we have looked at technology as a communicative process and product. We have found that the new technologies can bring the following benefits to teacher development:

- . increase access to instructional resources through the Internet;

utilizing power point or simulations in lectures and demonstrations. Students should also have the opportunity to use such applications in practical classes, seminars and assignments.

is also to enhance the knowledge and skills of academic staff on such issues as:

- i. teaching of large classes;
- ii. effective utilisation of meagre resources;
- iii. modern methods of assessment and evaluation of students' performance;
- iv. basic guidance and counselling techniques;
- v. basic skills of curriculum development and
- vi. techniques for writing r
- vii. grant proposals.

Certainly, the teacher of English Language should benefit.

- ii. latest journals, books and other library materials published by Nigerian academics;
- iii. latest core journals and textbooks in major disciplines (including English) offered in Nigerian universities that are published outside of Nigeria;
- iv. all major Nigerian dailies with Internet presence;
- v. lecture notes;
- vi. videos of lectures; and
- vii. database of experts on higher education in Nigeria.

- . share experiences through the Internet;
- . increase access to teacher development through distance teaching and learning; and
- . increase flexibility in what to learn, how to learn, and when to learn.

We need to engage the teacher of English Language in various activities to be able to realise the above benefits:

- i. train the teacher to improve his competence in using the new technologies in his instructional activities;
- ii. train and assist the teacher in producing teaching and learning resources;
 - train the teacher and student in computer literacy; and
 - acquire adequate facilities so that the identified new technologies are the most conversant with the technologies?

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- technologies can be used as part of the instructional resources in the institutions.
- Permit us this final word – that the pervasiveness of the English language is astonishing; indeed, 75% of the language of ICTs is English. Is there a stronger justification, then, for the teacher of English to be
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DETERMINATION OF THE DEFLECTION OF THE VERTICAL COMPONENTS USING SATELLITE- GEOMETRIC TECHNIQUES - A CASE STUDY OF LOBI AREA, MAKURDI, BENUE STATE, NIGERIA

AMEH, BENJAMIN MGBEDE
AGBO, JOSEPH AGBAJI

Abstract

The subject under consideration is a research work on the determination of components of the deflection of the vertical of Lobi area in Makurdi, Benue State using Geometric Method. The Geometric method of determining components of the deflection of the vertical involves the practical integration of Global Positioning System (GPS) GNSS observations and Precise leveling techniques. The results of the observations were used to compute the components of vertical deflection using the Least Squares adjustments. Using the method described, the deflections of the vertical components of the test point were determined. The estimated parameters are -3.18 ± 0.60 and -2.25 ± 0.43 arc seconds for the north-south and east-west components; respectively. The deflection of the vertical components at the same station was calculated using the EGM96 and EGM2008 spherical harmonic models. The associated standard errors of the processed vectors of the network were computed. The results obtained in magnitude are significant findings, demonstrating the ability of the method to resolve the deflection of the vertical components from GPS and precise leveling observations in local areas.

Keywords: Geometric technique, deflection of the vertical components, Orthometric Height, Ellipsoidal Height, Geoid Undulation, GNSS.

1.0 INTRODUCTION

Survey instruments are designed such that they rely on gravity (a spirit level or level vial) to be set up. Therefore, the instrument's vertical axis coincides with the plumb line (running through the station) and not the ellipsoidal normal. The effect of this difference is negligible in the setup, except when using towers for geodetic observations. However, it is not negligible in accurately measuring zenith (or elevation) angles, this difference in reference axes must be accounted for. Also, when leveling, one levels along the surface perpendicular to the plumb line running through the instrument, the result is seen as a variation in geoid undulation from station to station.

Thus, it is possible to compute vertical deflection at a station knowing the computed (geodetic) zenith angle and differencing this with the measured zenith angle. Or, vertical deflection may be computed by knowing how geoid undulation varies as a function of position.

In addition to improving functional models, these models and procedures can be utilized for gross error

detection and testing of atmospheric refraction models. Using worldwide gravity anomalies, the National Geodetic Survey (NGS) has compiled geoid undulation and deflection of the vertical models (GEOID96 and DELFEC96, respectively) for the contiguous United States (NGS, 1996b and NGS, 1996a, respectively). This *a priori* knowledge of the geoid can be utilized for gross error detection in survey networks that combine GPS with zenith angle and/or leveling data. The *a priori* knowledge can also be utilized in further studies of atmospheric refraction models, since modeling atmospheric refraction has always been the weakest link in geodetic networks (Brunner, 1984).

1.2 THE DEFLECTION OF THE VERTICAL

The deflection of the vertical (ϵ) is the angular difference between the direction of the gravity vector (g), or plumb-line at a point, and the corresponding ellipsoidal normal through the same point for a particular ellipsoid (Featherstone, 1999).

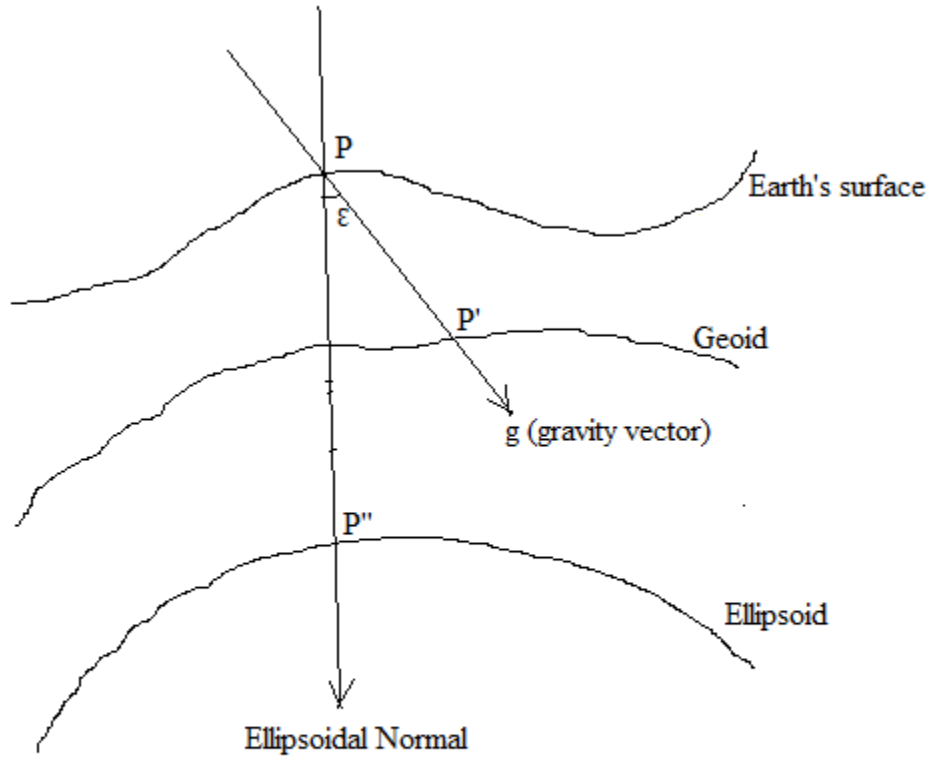


Figure 1.1 The deflection of the vertical (Featherstone W. E., 1999)

The undulation of the equipotential surfaces results in the local variations of gravity, and therefore, plumb-lines change direction from point to point (deflection of the vertical). The deflection of the vertical, which is a vector quantity, is usually decomposed into two mutually perpendicular components: a north-south or meridional component “ ξ ” (xi), which is reckoned positive northward, and an east-west or prime vertical component “ η ” (eta), which is reckoned positive eastward. In other words, the deflection components are positive if the direction of the gravity vector points further south and further west than the corresponding ellipsoidal normal (Vanicek and Krakiθwsky, 1986), or the level surface is rising to the south or west, respectively, with respect to the ellipsoid (Bomford, 1980).

These two components reduce to the total deflection of the vertical according to Pythagoras’ theorem

$$\varepsilon^2 = \xi^2 + \eta^2$$

(1.1)

and the component of the deflection of the vertical can be resolved along a geodetic azimuth (α) by

$$\varepsilon = \xi \cos \alpha + \eta \sin \alpha$$

(1.2)

In terrestrial surveying, the deflection of the vertical has four primary uses:

- transformation of astronomical coordinates to geodetic coordinates;
- conversion of astronomic azimuth to geodetic azimuth; and reduction of vertical and horizontal angles, and length measurement to the ellipsoid.
- It is also used in geoid modeling processes.

1.3 Statement of the Problem

The most common abuse of vertical deflections is their neglect in survey reductions and computations (Featherstone, 1999). This renders the measurements impractical for survey computations and representation of position. Therefore, account must be made for the orientation of the survey instruments in the Earth’s gravity field, so that the measurements are of practical use. There is no gainsaying that infrastructural developmental indices are planned, designed and implemented based on a well defined geoid, and hence the need for evaluating the deflection of the vertical of an area. It is within this background that this research is very necessary.

1.4 Aim and Objectives of the Study

The aim of this research project is to compute the components of the deflection of the vertical of Lobi Area of Makurdi, Benue State, using a combination of GPS and precise leveling observations.

The objectives of study include the following;

- viii. Determining the Geodetic coordinates points established within the study area by GPS observation.
- ix. Determining the orthometric heights of all the points by precise levelling.
- x. Computing the components of the deflection of the vertical using Least Squares estimation techniques from the processed data obtained by GPS and Levelling observations.
- xi. Computing the associated standard errors and variances of the observation.

1.5 Study Area

The study area is Lobi area of Makurdi, Benue State. See figure 1.3. This area also known as the Government Reservation Area (GRA) is a low density, modern high status facility neighborhood. The onset of colonial administration saw the development of well established housing estates at Lobi for the predominantly high-class European residents. It lies between latitude 07° 42’ 59’’N and 07°44’00’’N of the equator and between longitude 08°31’23’’E and 08°32’21’’E of the Greenwich Meridian. Lobi covers an area of about 15.71 square kilometers.

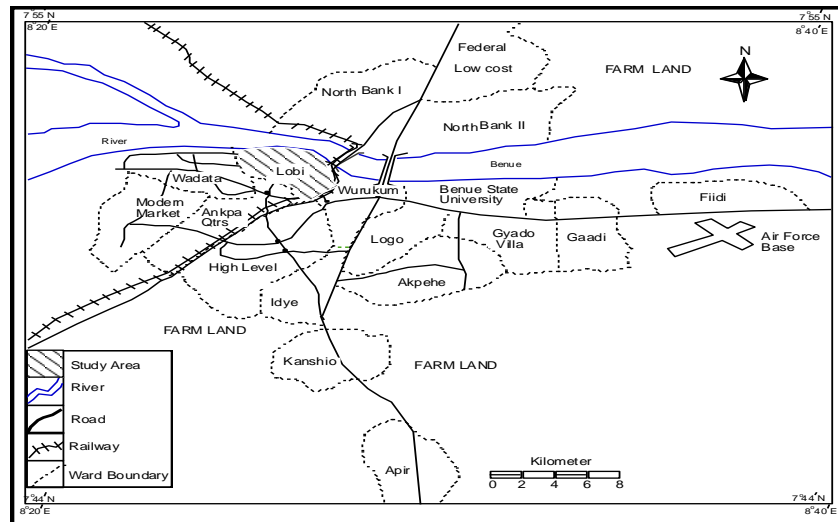


Fig. 1.3: Map of Makurdi Showing Study Area (Source: Benue State Ministry of Lands and Survey, Makurdi, 2021).

2.0 METHODOLOGY

Geometric method was employed to determine components of vertical deflection of the study area. This method involves the combination of GNSS/Global Positioning System (GPS) and Precise leveling observations. GNSS/GPS observation provides the Ellipsoidal coordinates of points while the orthometric heights are determined by geodetic leveling. Fifteen points (stations) evenly distributed were selected and monumented within the study area. One of the points (ABM 7) served as the test station at which vertical deflection components was computed. All other points

surrounding the test station (ABM 7) served as ancillary stations. GPS observation on static mode for at least 30 minutes and Precise levelling were carried out on all the selected stations. The acquired field data were then processed to get the final ellipsoidal coordinates and orthometric heights of all the points. The components of vertical deflection were then computed from the observed orthometric height differences and ellipsoidal heights differences of the test and ancillary stations, using Least Squares estimation techniques.

2.1 RESULTS AND DISCUSSION OF RESULTS

2.1.1 RESULTS

The deflection of the vertical components of the station ABM 7S located in the study area were estimated from the ellipsoidal height differences inferred from global positioning system (GPS) measurements and

orthometric height differences calculated from precise leveling using a simple formulation. The data in table 2.1 was used to compute the results in table 2.2. The various results obtained are shown in the following tables.

TABLE 2.1: OBSERVED CO-ORDINATES

STATION	NORTHINGS (m)	EASTINGS	LATITUDE ° ' "	LONGITUDE ° ' "	ELLIP. HEIGHT (m)	ORTHO. HEIGHT (m)
ABM 1S	856068.8426	448124.9663	7 44 43.70334N	8 31 43.90565E	94.527	74.676793
ABM 2S	855964.4466	447908.1118	7 44 40.29602N	8 31 36.82978E	99.883	80.035373
ABM 3S	855976.0725	447360.3244	7 44 40.65465N	8 31 18.94575E	89.273	69.431598
ABM 4S	855537.7902	446939.9527	7 44 26.36731N	8 31 05.23810E	95.387	75.541601
ABM 5S	854991.1391	447192.7695	7 44 08.57588N	8 31 13.51184E	99.367	79.516096
ABM 6S	855401.4076	447389.8016	7 44 21.94277N	8 31 19.92917E	96.926	77.071563
ABM 7S	855485.0422	447873.9673	7 44 24.68381N	8 31 35.73249E	112.394	92.518681
ABM 8S	854863.8312	447754.0491	7 44 04.45080N	8 31 31.84018E	114.877	95.013531
ABM 9S	854563.0231	448166.0269	7 43 54.67038N	8 31 45.30056E	119.581	99.713606
ABM 10S	854289.6495	448768.4514	7 43 45.79000N	8 32 04.97708E	118.807	98.932499
ABM 11S	854402.017	449092.5511	7 43 49.46054N	8 32 15.55361E	111.799	91.931239
ABM 12S	854687.3869	448884.2937	7 43 58.74576N	8 32 08.74470E	117.690	97.810347
ABM 13S	854731.0664	449286.1344	7 44 00.18232N	8 32 21.86170E	107.5822	87.703517
ABM 14S	855038.1919	448616.9364	7 44 10.15961N	8 32 00.00397E	134.7212	114.8586
ABM 14A	855704.7792	448207.5237	7 44 31.85122N	8 31 46.61406E	119.293	99.461968
ABM 15S	855421.7638	448982.6546	7 44 22.66301N	8 32 11.92970E	102.471	83.1049
FBM MKD	855788.8656	448718.992	7 44 34.60768N	8 32 03.30899E	92.219	72.846548

Source: Author’s field work

TABLE 2.2. ESTIMATION OF VERTICAL DEFLECTION COMPONENTS FROM GPS/LEVELLING DATA

No	From A	To B	Orthometric Height diff., ΔH_{AB} (m) $H_A - H_B$	Ellipsoidal Height diff., Δh_{AB} (m) $h_A - h_B$	$\Delta h_{AB} - \Delta H_{AB}$	$\frac{\Delta h_{AB} - \Delta H_{AB}}{S_{AB}}$	$\cos \alpha_{AB}$	$\sin \alpha_{AB}$
1.	ABM 7S	ABM 1S	17.841888	17.867	0.025112	-0.00003950	0.9200646	0.3917668
2.	ABM 7S	ABM 2S	12.483308	12.511	0.027692	-0.00005760	0.9975837	0.0694747
3.	ABM 7S	ABM 3S	23.087083	23.1208	0.033717	-0.00004743	0.6925918	-0.7213298
4.	ABM 7S	ABM 4S	16.97708	17.0066	0.02952	-0.00003154	0.0556381	-0.9984510
5.	ABM 7S	ABM 5S	13.002585	13.0274	0.024815	-0.00002948	-0.5904318	-0.8070876
6.	ABM 7S	ABM 6S	15.447118	15.468	0.020882	-0.00004249	-0.1724151	-0.9850244
7.	ABM 7S	ABM 8S	-2.49485	-2.483	0.01185	-0.00001872	-0.9823119	-0.1872523
8.	ABM 7S	ABM 9S	-7.194925	-7.1872	0.007725	-0.00000798	-0.9535538	0.3012229
9.	ABM 7S	ABM 10S	-6.413818	-6.4133	0.000518	-0.00000035	-0.8018889	0.5974732
10.	ABM 7S	ABM 11S	0.587442	0.5952	0.007758	-0.00000476	-0.6659243	0.7460193
11.	ABM 7S	ABM 12S	-5.291666	-5.2958	0.004134	-0.00000321	-0.6213021	0.7835711
12.	ABM 7S	ABM 13S	4.815164	4.8118	0.003364	-0.00000210	-0.4724234	0.8813717
13.	ABM 7S	ABM 14S	- 22.339919	-22.3272	0.012719	-0.00001467	-0.5169450	0.8560186
14.	ABM 7S	ABM 14A	-6.943287	-6.8994	0.043887	-0.00010983	0.5535874	0.8327911
16.	ABM 7S	ABM 15S	9.413781	9.9227	0.508919	-0.00045812	-0.0562398	0.9984173
17.	ABM 7S	FBM Mkd	19.672133	20.175	0.502867	-0.00055979	0.3413702	0.9399289

Source: Author’s field work

Using the method described, the deflections of the vertical components of the test point, ABM 7S, were determined. The estimated parameters are -3.18 ± 0.60 and -2.25 ± 0.43 arc seconds for the north-south and east-west components; respectively. The deflection of

the vertical components at the same station was calculated using the EGM96 and EGM2008 spherical harmonic models. The results obtained and the results of previous work done by other researchers are shown in Table 2.3 for the purpose of comparison.

Table 2.3 The deflection of vertical components.

Researcher	Method	Location	The deflection of the vertical components	
			ξ (North-South)	η (East-West)
Author	GPS/Leveling	Lobi Makurdi	-3.18" \pm 0.60"	-2.25" \pm 0.43"
Author	EGM2008	Lobi Makurdi	-0.054"	-0.004"
Author	EGM1996	Lobi Makurdi	-0.037"	-0.014"
Kantomah A. (2010)	GPS/Leveling	ABU Zaria	-2.677"	3.455"
Tse and Baki lz (2006)	GPS/Leveling	Hong Kong	-7.3 \pm 1.6	5.3 \pm 4.3
Ayhan Ceylan, (2009)	GPS/Leveling	Konya, Turkey	-4.15'' \pm 0.61'',	8.75'' \pm 0.69''

Source: Author’s field work

Table 2.4 The accuracy of Components of Deflection estimation from Least Square estimates.

Statistical Parameter	Value (°)	Value (")
Residuals:		
Minimum:	0.0000617614	0.22234104
Maximum:	0.0010560920	3.8019312
A posteriori variance	0.0000080299	0.02890764
A posteriori standard error	0.0028337078	10.20134808
Standard error of unknown parameters:		
σ_{ξ} :	0.0001654384	0.59557824
σ_{η}	0.0001180164	0.42485904

Source: Author’s field work

4.1 DISCUSSION OF RESULTS

The a posteriori variance of unit weight for the solution is 0.0000080299, indicating the use of an appropriate statistical model and weights for the solution. The residuals vary between 0.22 and 3.80 arc seconds. The standard errors of the north-south and East-West components are 0.59557824 and 0.42485904 arc seconds; respectively.

The results obtained from the measurement seem to agree with that obtained by Ayhan Ceylan, Tse and Baki lz, although there is a significant difference in the east-west components. The agreement of the deflection of the vertical components with that obtained by Ayhan Ceylan,2009, Tse and Baki lz,2006 in both directions and, to a certain extent, in magnitudes are significant findings, demonstrating the ability of the method to

resolve the deflection of the vertical components from GPS and precise leveling observations in local areas. Also, the use of existing first order leveling networks supplemented by GPS observations makes the approach attractive among alternatives.

4.2 Conclusion

Survey instruments are designed such that they rely on gravity (a spirit level or level vial) to be set up. Therefore, the instrument's vertical axis coincides with the plumb line (running through the station) and not the ellipsoidal normal.

Consequently, deflection of the vertical is a quantity that cannot be ignored in Geodetic survey reduction and computation. Large errors can occur even

with relatively insignificant magnitudes of vertical deflections over very short distances. If ignored, the majority of this error will be absorbed in the station's height coordinate. Horizontal errors, due to vertical deflection, arise from the difference between geodetic and astronomic coordinates.

Therefore, for some applications, the deflection of the vertical may no longer simply be neglected in survey computations and adjustments. It is appropriate to routinely apply corrections for deflections of the vertical to terrestrial survey data so that the measurements can be of practical use.

The result of determining vertical deflection via the leveling method, in the author's opinion, was a great success.

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INSECURITY AND POOR INFRASTRUCTURE: A HINDRANCE TO THE PERFORMANCE AND PRODUCTIVITY OF THE NIGERIAN TEACHER

Apah Gift E.

Department of Languages

Nigerian Army College of Environmental Science and Technology (NACEST)

07034407919 email: giftapah1@gmail.com

&

James .A. Kerker

Department of English,

Benue State University.

Abstract

Poor infrastructure and rise in insecurity has in the last two decades bothered all Nigerians In all spheres of human existence. The incessant insecurity challenges faced by Nigerians have dampened the economic growth of the country. This economic undergrowth leads to poor infrastructure been provided to various schools thus affecting the Academic and intellectual growth of the citizens.

Nigeria is Africa's largest economy and a major player in the global economy. But, her huge infrastructure deficit has constrained economic growth and development, thus inhibiting her ability to improve the quality of life as envisaged by her government at several levels. Nigeria's infrastructure is in a deplorable state and the nation's infrastructural needs in all sectors are evident for all to see.

The education sector is one of the sectors that suffer most in the face of daunting security challenges and poor infrastructure. Therefore, this paper attempts to explore how the security challenges and infrastructure deficit affects the performance and productivity of the Nigeria teacher.

Keywords: Security, Insecurity, Infrastructure, Performance and Productivity, and the Nigerian Teacher.

INTRODUCTION

Life in Nigeria has been a mix of daunting challenges and boundless opportunities. And the life of a Nigerian Teacher is not an exception. The Nigerian teacher in an attempt to survive faces a lot of challenges as the country still suffers with the seeming boundless opportunities. This has been projected a bizarre image of Nigeria as a country. These challenges affects the citizens' performance and productiveness especially the teachers. Performance can be defined as the ability of an individual to accomplish the assignments or duties given, based on the expectations of the organization, institution or establishment where he/she works to earn a living. Productivity can be defined as the ratio between a

measure of output and a measure of input. Productivity is a measure of job performance. An employees' productivity is a measure of how much the goals of the organization is being achieved through his commitment to and performance on the job. The productivity might be high or low depending on his input. In line with the nature of work an individual performs, his or her productivity can be determined in various ways. Depending on the challenges of the organization, institution or establishment, individuals will manage, evaluate and update their own performance on a regular basis to improve on their productivity.

The quality of education in Nigeria has been a source of concern to all stakeholders in recent times. It has been observed that there is poor quality of products from all levels of the education system. It is accepted that

teachers constitute the most important input in the system that determines the quality of output, more important than the amount of resources on ground. If the teachers in any nation are not committed, not

inspired, not motivated, and are lazy, immoral and antisocial, the entire nation is doomed. Teacher education is what makes the difference between a teacher and a cheater in the job. Therefore, the

Factors Affecting the Performance and Productivity of the Teacher.

There are so many factors that affect the performance and productivity of individuals in any working environment. The major factors include: poverty caused by poor economy, bad governance which manifest in the incessant security challenges and poor infrastructures in a work environment. Other factors are poor incentives, laziness, poor management and when employees are placed in the wrong roles. The fallout is that some employees end up performing poorly thus unproductive to the society. The crux of this paper is how these two factors: insecurity and poor infrastructure affect the

Insecurity

For a proper understanding of insecurity, it is better to conceptualise 'security'. In ibidapo-obe's opinion, security is 'the situation that exists as a result of the establishment of measures for the protection of persons,

On the other hand, insecurity means the state of being exposed to attacks. The insecurity situation in the present Nigerian democratic dispensation has intensified since the 2009 attack by boko haram in Borno state. Till date, boko haram has killed more than 12 thousand Nigerians, despite the government measure in curtailing sect heinous crime against humanity. Apart from the activities of the dreaded Islamic sect, Nigeria has also witnessed a surge in communal and herds men clashes, kidnapping, youth restiveness oil bunkering, militancy and arm robbery, ethno-religious strife, political violence and a host of others. Security is one of the fundamental needs of any human society. In a society where there is no security, the population is likely to be

Infrastructure in the Teaching Environment

A work environment can be defined as the totality of conditions under which a person or a group of person or a group of persons works or performs his or her duties. A work environment can be in form of physical environment, human environment and relationship with colleagues and administrators, interaction within the

performance and productiveness of the teacher is paramount to the growth and development of the economy.

performance and productivity of the Nigerian teacher. This agrees with David Cowan's view on the effects of the insecurity and poor infrastructure thus: 'the challenges of insecurity and poor infrastructure might play part in dampening the growth prospects. The problem of insecurity.... Will continue to have a negative impact on tourism, but probably less so on wider corporate investment unless it becomes a more serious issue. The infrastructure constraint is still very much an issue holding back a growth pick-up, '(3).

influences and actions '(ibidapo-obe 2008). It is a situation where people go about their normal business without any threats to their lives and properties (ogunleye et al. 2011).

vulnerable to attacks from perceived enemies. Insecurity is the state of being insecure or unsafe. The state is liable for providing security for members of the public. Wherever a state fails in this regard, the state is considered to be a weak state. Most of the weak states in the world are considered to be a weak state because they failed in their primary function in providing security for their citizens (rice 2007). Since the return of democracy in 1999, the country has been facing a lot of security challenges. Grappling with the security situation in Nigeria, it is the duty of the Nigerian government to formulate and implement policy, which will promote national cohesion and integration (oshodi 2011).

system and the general aura of the work climate. Nkpodia (2006) believes that in any educational arrangement, the success lies in the commitment of the teachers. But in Nigeria, teachers who are the shapers of civilization and are essential to the intellectual development of the citizens of a country are affected by insecurity and poor infrastructure which translates to the

learners. The security challenges and poor infrastructure makes the environment uncondusive for teaching and

Physical Appearance of the School

Most people do not consider the importance of the school environment to the teacher's performance and productivity. Thus, such people may not appreciate the negative impart of dilapidated, leaking and ill-ventilated school house with broken window panes, or defective walls, or muddy and sandy flour, on the teachers' behaviour. It would be stating the obvious to say that no normal teacher would embrace such a social environment, as it leads to students' anger, tension and

The importance of comfortable sitting in effective classroom control cannot be over-emphasized. Sommer (as cited in Tawari, 1993:171), concluded that: when students sit in a semi-cycle style, those directly facing the teacher participated more than those on the sides; when students sit in rows lecture style, those in front participate more than those at the sides'. Corroborating this finding. Adams and Biddle (as cited in Tawari, 1993), observed that 'students in periphery of the classroom are spectators rather than actors in the classroom drama. When students are accommodated in overcrowded rooms, it is difficult for the teacher to recognise classes in small groups, and the degree of concentration of the students, are impeded. Udofot

This situation can be properly realised in a rural environment where the human and vehicular traffic is less, as not to cause unnecessary distraction. Such outdoor classrooms are good for non-science classes where there is no need for a regular science laboratory. It is emphasized that caution must be exercised during the beginning of the rainy season when there is frequent

The Teacher and her Roles to Nation Building

A teacher is considered as a professional, who imparts knowledge, learning experiences at his disposal to stimulate, guide, direct and facilitate learners to acquire adequate mastery of the skills being imparted. Ajayi, (2004) defined a teachers as someone who causes learning to take place: someone who imparts knowledge, skills, values and attitudes to a group of learners.

learning thus affecting the performance and productivity of the teacher.

frustration, and inhibits effective classroom control. Our school environment should be clean enough to be attractive and appealing to both the teacher and the student. This will in turn motivate even the most unwilling teacher or student to become interested in teaching and learning. The overcrowded building is not only repulsive but energy-sapping as students struggle and wrestle over sitting positions. In some cases, the students lean on the walls and hang near windows to listen to the teacher.

(1995) rightly observed that 'In such classes, teachers can only talk to learners as a group, instead of giving them individual attention, classroom space and class size could help to dictate the teacher's teaching approach. This in turn could affect classroom discipline,' while spacious classroom could allow for small and large group discussions and activities, narrow classroom on the other hand would tend to allow for teacher-dominated teaching and no face free communication among the learners and between the teacher and the learners. In cases of acute classroom shortage, the teacher can assemble his students outside under shades of trees where such exist.

lightening and whirl wind. Outdoor classrooms may not be encouraged or enjoyed in the North because of the frequent whirl, dust-laden wind, especially during harmattan season. The cold wind can also be uncomfortable and dangerous for the students to endure. (Nwideeduh, 2003). It is generally believed that job environment is a direct reflection of performance.

Obviously, form the definitions, a teacher is one who helps the learners often in a school, as well as in a family, religious and community setting acquire knowledge for the betterment and upliftment of the society. Learning cannot take place without the teacher, even though he is not physically present; he is indirectly represented by the medium through which learning takes place.

The teacher is an important factor in the quality of education in any nation. They are the last post to translate government policies and intentions into practical form. A teacher performs a number of functions in the system to facilitate effective teaching and process. According to Adepoju in Ajayi and Ekundayo (2010) the functions of every teacher include: explaining, informing and showing how; initiating,

directing and administering; unifying the group, that is, making students to relate to him and others very well; giving security; clarifying attitudes, beliefs and problems; diagnosing learning problem; making curriculum materials; evaluating, recording and reporting; enriching of community activities; participating in school activities; and participating in professional and civil life.

The Federal Republic of Nigeria (1998) in the Nigeria Teachers Service Manual highlighted the extra-curricular activities of teachers thus:

- a) All teachers shall participate in extra-curricular activities as part of their regular duties.
- b) Without the express written permissions, the relevant school board, a teacher shall not, outside school hours, undertake any other business for profit.
- c) Without the express written permission of the relevant school board, a teacher shall not act as editor or take part directly or indirectly in the management of any commercial newspaper or broadcasting service.
- d) Unless necessitated by the discharge of his duties, a teacher shall not disclose to any member of the public the contents of any official document or report which has come into his possession in the course of his employment.

The roles of a teacher is stipulated above suggest that the teaching exercise is a 24-hour service. However, Ajayi (204) emphasised that for teachers to perform their functions effectively the school environment must be made conducive to learning by all stakeholders. Productivity can be determined through job evaluation and appraised the extent to which the objectives of education have been attained. This can be done or

determined through classrooms climate and management, evaluation of teachers teaching techniques and methods, effective communication skills and soon. One way of determining the productivity of teachers is to assess what teachers do. According to Ukeje (1990) who sited Rosecrans's speech during bowling Green conference at ohio, described the competencies of a good teacher as follows:

- What they teach and how to teach
- The nature of human organism
- How learning takes place, how to motivate behaviour
- How to help become appraise an individual to meet educational diagnosis and help persons develop in a desirable fashion.
- How to help people think critically.

There are many compelling reasons being made for teachers to access their level of performance and hence productivity vis-à-vis their work environment. When the appraisal of teachers is aimed at, it determines the degree to which teachers' orientations and classroom instructions contribute effectively towards achievement of educational goals, and thereby becoming very helpful and profitable (Eferakeya, 1998) in fact, teachers at all levels are very important in the overall development of a nation through their impart in the educational system, since education is the door to civilization and modernization of any country.

Conclusion

Obviously, it is the teachers who hold the key to the growth and development of any country through performances of their primary functions in the country. Therefore, the quality of any educational system depends to a great extent on the quality of any educational system depends to a great extent on the quality of teachers in terms of academics and professional qualification and experience as well as their level of competency in and dedication to their primary

function. In fact, the teachers count more important than any other factor which contributes to the quality of education at any of our educational system. Hence, Anderson and Dyke (1972) asserted that, 'the corner stone of good education in any school is its faculty (teachers); fine buildings and equipment, special services and all other factors which help to provide favourable environment for learning mean little if the learning experiences are directed by incompetent teachers'.

There is also need for improvement in the level of the infrastructural facilities in schools. This, however, depends to a large extent, on the level of funding made available to the system. Ibukun (2004) advocated for modern educational gadgets like computers, modern instructional materials and packages to be consciously introduced into the teacher education programme. It must be noted that no programme, no matter how well intended, can succeed if adequate infrastructural facilities are not provided for implementation.

Therefore, if Nigeria must re-engineer her economic, political and social systems, a great deal of thought must be given to the inputs and management of the teacher.

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This presupposes that improvement on teacher education is invariably, a way to improve the general productivity of the society. The lack of interest, concentration and continuity in the teacher work caused by insecurity and poor infrastructure reduces their performance and productivity especially when coupled with the absence of on-the job training programmes, seminars and conference to update their motivated, frustrated and unproductive. The government of any state should be responsible to ensure that teachers perform to the best of their abilities. It is hoped that improve the work environment of the teachers for greater productivity.

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CULT RADICALIZATION: ITS EFFECT ON TRADE IN MAKURDI LOCAL GOVERNMENT AREA OF BENUE STATE

AKINBILE, I.O.

School of General Studies, Department of Humanities Nigerian Army College of Environmental Science and Technology, Makurdi, Benue State. Nigeria.

Abstract

The study examined the effect of cult radicalization on trade and business activities in Makurdi LGA of Benue State. The method of random sampling technique was used to select 5 council wards from the 11 council wards in the area and a purposive sampling was used to select 160 representative business owners in the sampled area which were administered questionnaires. Data were collected and analyzed descriptively using tables, charts and paired sample t-test. The study revealed that there is a significant difference in trade before and after radicalization. Result indicated a level of decrease in trade activities, which was a result of the cult clashes. It shows that there's a significant difference in the type of trade activities before and after radicalization and the reason is mainly for security. The study concluded by highlighting the urgency of the need for the various stakeholders to act in curbing the menace if the goals of trade, investment and productivity were to be achieved. Recommendations were made on the responsibility of government at the federal, state and local levels as well as private and traditional institutions to establish all-inclusive processes of de-radicalization of cult members.

Keywords: Cult, radicalization, trade.

1. INTRODUCTION

Insecurity has continued to be an issue of concern to government, religious organization, families and individuals. Amongst the insecurity issues is cult radicalization. For a successful anti cultism campaign, scholars emphasize a combination of military and non-military strategies. While the military strategy is useful

Cult members have been known to become radicalized after few hours of indoctrination (Amanda, 2019). Most cults build on or modify existing religious doctrine to become ideologically radicalized. This doctrine inflicts radical behavior on members. Some of

Cultism has in recent years become problem of global significance and implications (Union of International Associations, 2020). The causal factors of cult radicalization in Nigeria has been linked to many unfortunate developments over unfounded arguments on religious beliefs, quest for social identity, revenge, quest for power and protection. Others include societal decadence, intolerance and many other social factors (Ajol, 2015). Many of the aforementioned factors can be corrected or alleviated, reducing the risk of

to weaken the armed capacity of the group, the non-military strategy will tackle the underlying problems fuelling cultism. Cult radicalization provides fertile ground for its members to steal, rape, kill as well as commit human rights abuses. The challenge of tackling radical cultists is a common consequence of failed institution (Wellington, 2014).

these doctrines make members believes they are supreme, immortal and so on. Cult radicalization is all-encompassing, particularly with regard to morality, ideology and belief.

radicalization. However, some scholars believe that, even if cult ideologies dies out tomorrow, psychological and circumstantial factors would create an environment conducive for radicalization (Satterley, 2016). Cultism can adversely affect trade in several ways. For example, conflict can disrupt the supply and distribution of inputs and outputs, create price increase and cause massive displacement of labor. These compounding challenges make trade and investments difficult to maintain in such environments.

Benue is a state with great potential to increase her trade index. However, it has recently experienced severe episodes of cult radicalization and conflict, which have negatively influenced trade and investment. In recent times, Makurdi LGA has been plunged into series of cult clashes, flashes of armed attacks and silent killings at different locations within the area. Suffice to say Makurdi LGA is largely an urban settlement, occupation is mainly commercial and

houses exist not in isolation yet provide a fertile ground for systematic attacks to thrive. The radicalization of cult members has impeded the basic right of movement of people within the area. Unsuspecting persons are attacked on their way to work. The present study is to examine cult radicalization: its effect on trade in Makurdi Local Government Area of Benue State. The following hypothesis will be tested:

Purpose of the Study

The purpose of the study is to determine the effect of cult radicalization on trade activities in Makurdi Local Government Area of Benue State.

Hypothesis

H₀: There is no significant difference in trade activities before and after radicalization.

H₁: There is a significant difference in trade activities before and after radicalization.

2. The Study Area and Method of Study

2.1 The study area

Makurdi, the Benue State capital was established in the early twenties and gained prominence in 1927 when it became the headquarters of the then Benue Province. Being a river port, it attracted the establishment of trading depots by companies such as UAC and John Holt Limited. Its commercial status was further enhanced when the Railway Bridge was completed and opened in 1932. In 1976, the town became the capital of Benue State by Gen Murtala Mohammed (<https://www.iambenue.com>, 2021). The town which is located between latitude 7°38'N - 7°50'N, and longitude 8°24'E and 8°38'E has a landmass of about 41sqkm. It is situated in the Benue Valley in the North Central Region of Nigeria. It is traversed by the second largest river in the country; the River Benue (Abah, 2013). Makurdi population is estimated at 422,159. This population represents the urban agglomeration of

Makurdi, which typically includes Makurdi suburban areas ([World Urbanization Prospects](#) 2019). Makurdi is a miniature Local Government with people from various parts of the country including foreign nationals ([World Urbanization Prospects](#) 2019). The 0.8km long combined rail and road bridge across the Benue River consolidated the town's position as a major transit point for trade. Makurdi is located on the main highway network and has an airport; it is now a major transshipment point for cattle from Nigerian's Northern States. From June – November when the Niger River has high water, Makurdi serves as a port from which goods, including locally grown sesame seeds and cotton are shipped to Lokoja. The town is a local trade centre for yam, sorghum, millet, rice, cassava, shea nuts, sesame oil, peanuts (groundnuts), soybeans and cotton raised by the Tiv, Idoma and Igede people of the surrounding area.

2.2 Method of study

The study area has 11 council wards for administrative convenience. They include: Agan, Ankpa/Wadata, Bar, Central/South Mission, Clerks/Market., Fildi, Mbalagh, Modern Market, North Bank I, North Bank II and Wailomayo Council Wards (Ekhuemelo et al., 2019) However, 5 council wards namely; Ankpa/Wadata,

Clerks/Market., Modern Market, North Bank I and North Bank II were randomly selected for use in Makurdi LGA. All of which were visited several times during the time of reconnaissance survey in order to; familiarize with the terrain of the area, identify places with radical cult members, identify cult camps, ascertain

the distances of such camps from business area, identify the sizes and type of business and assess the cause of radicalization and its rationale. Field observation and Focus Group Discussion were necessary to determine extent of radicalization, effect on trade, predominant trade/venture, types of trade/venture undertaken. Direct field observation was carried out to confirm some responses given by respondents on the questionnaire that was administered. Thus, discussion also took place

between the respondents and the researcher to create conducive atmosphere for correct responses. The major instrument of data collection for this research is the questionnaire. Method of data analysis used was frequency, percentages and paired sample t-test. The paired sample t-test technique is used because of the nature of data.

Table 1.
Administration of Questionnaires across Council Ward

	Frequency	Percent
North Bank I	32	21.2
North Bank II	31	20.5
Ankpa/Wadata	30	19.9
Modern Market	28	18.5
Clerks/Market	30	19.9
Total	151	100

Source: Fieldwork 2022

Table 1 shows the distribution of questionnaires across the 5 sampled council wards in Makurdi LGA. North Bank has the highest number of respondents 21.2%,

closely followed by North Bank II with 20.5% then, Clerks/Market and Ankpa/Wadata with 19.9% each, the least among them is Modern Market which has 18.5%.

3. Result and Discussion

Table 2.
Cause of radicalization

	Frequency	Valid Percent	Cumulative Percent
Poverty	0	0	0
Quest for protection	144	95.4	95.4
Quest for dominance	3	2.0	97.4
Revenge	4	2.6	100
Joblessness	0	0	
Total	151	100	

Source: Fieldwork 2022.

The data obtained in table 2 shows that 144 respondents were radicalized as a result of rival attacks by cult members in the study area, only 3 respondents say their radicalization is actually as a result of quest for dominance in their area, the need to maintain dominance in the area informed their radicalization. While 4 respondents were radicalized to revenge death of

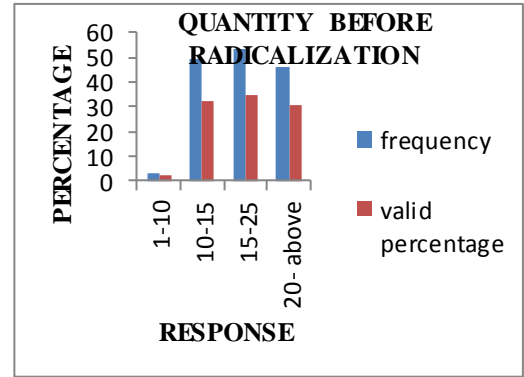
members killed by rival groups. No respondent was radicalized because of poverty, or joblessness. In most cases, perpetrator of such attacks have used looting and destruction of property as a tool to encourage members, while in other areas there are examples of local authorities actively guarding properties until security of lives are assured.

Table 3.
Quantity of goods sold before Radicalization

	Frequency	Valid percent	Cumulative Percent
Less than 10 bags	3	2.0	2.0
10-15 bags	49	32.5	34.5
15-20 bags	53	35.1	69.6
Over 20 bags	46	30.5	100.0
Total	151	100.0	

Source: Fieldwork 2022

The data captured in table 3 shows the quantity of trader’s sales before the radicalization. It shows that; 3 respondents sold less than 10 bags, 49 respondents sold 10-15 bags, 53 respondents sold 15- 20 bags and 46



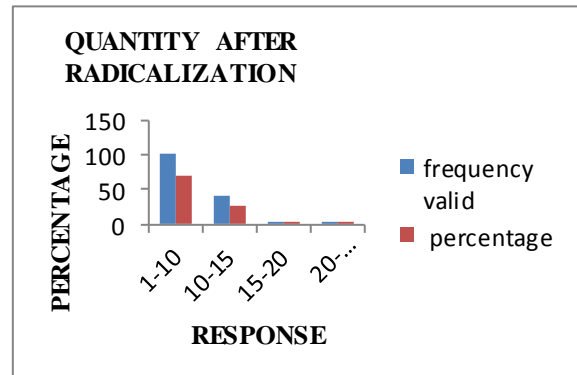
respondents sold over 20 bags. It shows that 35.1% of traders in the area of study sold 15-20 bags while the least category is those who sold less than 10 bags that make up 1.9% of the sample size.

Table 4.
Quantity of goods sold after Radicalization

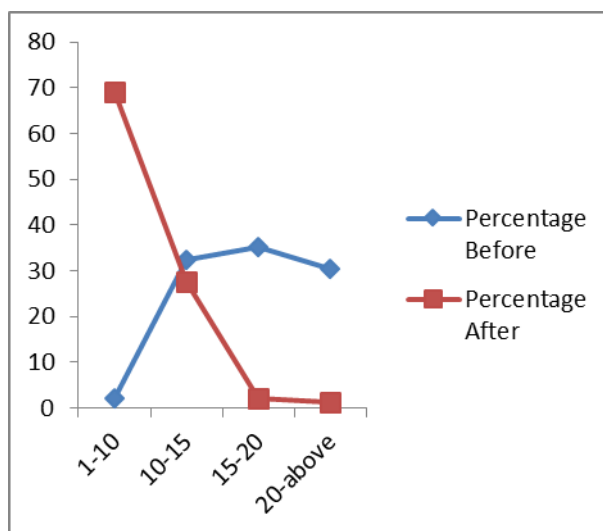
	Frequency	Valid percent	Cumulative Percent
Less than 10 bags	102	69.0	69.0
10-15 bags	41	27.7	96.7
15-20 bags	3	2.0	98.7
Over 20 bags	2	1.4	100.0
Total	148	100.0	
No response	3		
Total	151		

Source: Fieldwork 2022

The data captured in table 4 also show the quantity of trader’s sales after the radicalization. It shows that; 102 respondents sold less than 10 bags, 41 respondents sold 10-15 bags, 3 respondents sold 15- 20 bags and 2



respondents sold over 20 bags. It shows that 69.0% of traders in the area of study sold less than 10 bags after the radicalization while only 1.4% sold over 20 bags of the sample size.



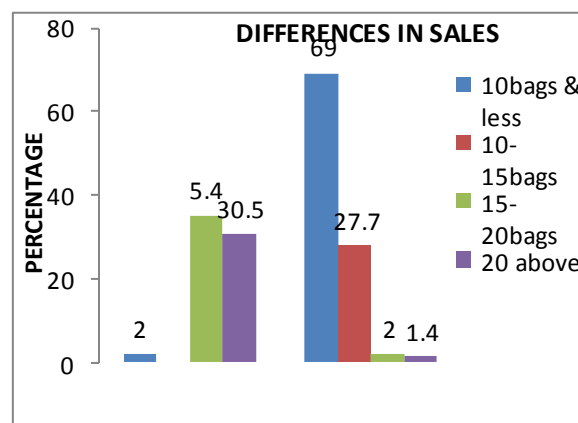
Source: Author’s Table 3&4 2022

Fig 1: Relating Quantity Sold Before and After Radicalization. The graph shows the relationship of quantity sold before and after radicalization, it reveals that a greater percent (35.1%) of respondents sell over

15 bags with just 2.0% that sell less than 10 bags before radicalization but after the radicalization, 69.0% of respondents sell less than 10 bags and 1.4% sell over 25 bags as oppose the relationship before radicalization.

Table 5
Difference in Sales Before and After Cult Radicalization

Quantity	% Before	% After	% Diff.	Remark
10bags & less	2	69	67	Increase
10-15 bags	32.5	27.7	4.8	Decrease
15-20 bags	35.1	2	33.1	Decrease
20 & above	30.5	1.4	29.1	Decrease



Source: Fieldwork 2022

Source: Author’s Table 5 2022

Fig 2: Difference in Trade Sales.

Table 5 shows the difference in percentages of traders that agree that there is a change in what they sell before and after cult radicalization. It can be seen that the percentage of sales from 10 bags to 20 bags dropped as shown by the decreased percentage difference before and after cult radicalization. This decrease however increased the number and percentage of traders that sold

less than 10 bags by difference of 67%. Suggesting that majority of traders in the area no longer sell what they normally do after radicalization. This has forcefully taken away Benue State’s comparative advantage of being food basket of the nation (Tersoo, 2022). This can be said that cult radicalization has affected trading activities. This was further established when 69% traders

reaffirmed that there is decrease in their sales capacity. There is growing concern among economists and practitioners that economic conditions prevailing in **Table 6.**

trader’s lives presently may have a persistent effect on their health and socioeconomic outcomes in life generally (Robert, 2000) cited in (Adegunroye, 2013)

Reason for the difference

	Frequency	Valid Percent	Cumulative Percent
Low turnout of buyers	28	19.0	19.0
Frequent cult clashes	98	66.2	85.2
High cost of price	9	6.1	91.3
Change in buyers’ taste	2	1.4	92.7
Hours spent on the business place	7	4.7	97.4
Others	4	2.7	100.0
Total	148	100.0	
No Response	3		
Total	151		

Source: Fieldwork 2022

Table 6 shows the causes of the changes in items sold in the study area; 28 respondents said low turnout of buyers is responsible for their poor sale, 98 respondents said it is frequent cult clashes that caused the poor sale, some 9 respondents said high cost of price is the cause of poor sales, 2 respondents agreed on change in buyers’ taste, 7 said is the number of hours they spent on business place that is responsible for the poor sales, 4 persons said is others factor beside the one’s mention that is

responsible, 3 respondents declined to answer the question. The table therefore suggests that an overwhelming 66.2% agreed that poor sales in the area is caused by the frequent cult clashes around the business environment which affect turn out of buyers as affirmed by 19% of respondents. High price, change in buyers’ taste, hours spent on the business place and other factors are the least cause of poor sales in the study area.

Hypothesis

H₀: There is no significant difference in trade activities before and after radicalization.

H₁: There is a significant difference in trade activities before and after radicalization.

Table 7: Paired Sample t-test Difference in Trade Activities Before and After Radicalization.

	N	Mean	SD	t _{val.}	crit _{val}	Df	P _{val}	Remark
Before Radicalization								H ₀ Rejected
After Radicalization	151	1.556	.573	33.368	1.984	150	.000	H ₁ Accepted

Table 1 shows that $t(150)=33.368 > 1.984$, $P.000 < 0.05$ level of significance. Therefore the null hypothesis was rejected and the alternative hypothesis was accepted hence probability value of .000 was less than 0.05 and t_{val}

of 33.368 is greater than crit_{val} of 1.984. Thus there is a significant difference in the quantity of item sold in the study area before and after the radicalization.

4. Conclusion

The study has shown that the causes of radicalization in the area are quests for protection, dominance and

revenge for dead members by rival groups, sending hundreds to their early graves and many fatally injured.

This has affected trading activities as many do not have access to their businesses as a result of cult clash, hence resorted to other options like changing from one item type to the other. Traders have relocated from areas where radical cult members are dominated to other towns. These therefore have resulted to decrease in trade in Makurdi Town and beyond. Trading provides a primary means of employment for Nigerians and

5. Recommendations

Based on the findings of the study, the following were recommended:

1. The government should at all levels, develop a clear de-radicalization strategies that are in line with international guiding principles.
2. Traditional and local leaders should be well involved in finding solutions to cult radicalization. The committees proposed above must have representatives of the local leadership.

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account for about 48% of the country's Gross Domestic Product (GDP) (Onyebuchi, 2022). In an economy that seeks to grow her sector and with high rate of youth unemployment, there is an urgent need to arrest the situation before it gets out of hand. For this reason the prospects of providing an enabling ground for sustainable trade and investment requires and immediate attention.

3. Government institutions should be strengthened to effectively address arms proliferation in the state. The need to reinvigorating institutions responsible for resilience is critical.
4. The processes of reconciliation should be consolidated by ensuring that perpetrators of the violence are identified and brought to justice.
5. The government should seek technical support and training for denounced cult member.

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USE OF CONSTRUCTION AND DEMOLITION WASTE IN GEOTECHNICAL ENGINEERING: A REVIEW

CHRISTOPHER N. DURU

Dept. of Civil Engineering Technology Nigerian Army College of Environmental
Science and Technology Makurdi
email: nduruchris@yahoo.com

&

CHARLES M.O. NWAIWU

Dept. of Civil Engineering, Nnamdi Azikiwe University Awka
email: cmo.nwaiwu@unizik.edu.ng

Abstract

The availability of land with desired engineering properties for infrastructural development such as construction of residential buildings, recreational centers, office complex, roads, runways and other public utilities is fast drifting away each day due to scarcity of buildable land especially in the urban cities. This has led to construction of structural foundation on unsuitable soils with poor engineering properties. Often times, this practice has resulted in foundation failures. Therefore, it has become very imperative to improve the engineering behaviour of such soils by the use of alternative materials. This paper reported the basic Engineering properties of recycled construction and demolition wastes (C&DW). The effects of these wastes on the geotechnical properties of weak and unsuitable soils when recycled are reviewed. Engineering Properties of soils are discussed with respect to various combinations of recycled construction and demolition (C&D) wastes. As an alternative effort to mitigate the negative impact of solid waste in the environment, various researches cited on this paper showed a tremendous improvement in the geotechnical properties of weak and unsuitable soils using recycled C&D wastes.

Keywords: Construction and demolition waste (C&DW), Geotechnical properties, Marble dust, Concrete aggregates, Recycle, Weak soil, Improvement.

INTRODUCTION

Infrastructural development is known to be facilitated by construction industry for economic growth especially in developing countries. Construction and demolition waste is one of the heaviest and most voluminous wastes generated by construction sector (Jayakody et al, 2018). Mineral waste from construction and demolition projects sites is produced in large quantities worldwide

For the purpose of this study, C&DW is defined as the waste resulting from new construction, remodeling or the demolition of structural building. C&D wastes reportedly contributed as high as 75% of globally generated solid waste. (Olumuyiwa et al, 2019). The

Research had shown that housing construction is responsible for producing varieties of waste such as wood, concrete, metal, brick, drywall, roofing, material packaging, plastics, papers, cardboard and others (Lau et

(Henzinger and Heyer, 2017; Pourtahmasb and Karim, 2014). This is not without negative impact to the environment (Lee et al. 2013; Devarajan and Sasikumar, 2015; Amaya and Emy, 2018; Yadav and Dave, 2015; Macedo et al, 2016 and Mamani et al, 2021) as waste materials litter around it.

amount of this waste generated is directly proportionate to the great demands of projects such as residential building, road construction, hypermarkets or shopping complex and many infrastructure projects need for upgrading life (Lee et al. 2013 and Uday et al, 2021).

al. 2008). The amount of C&W waste generated depends on the stage of construction and methods of construction practice used on site. Li, et al (2017) has established that the amount of C&DW generation in China accounted for

about 30- 40% of total urban solid waste annually. The researchers specifically stated that demolition of 1m² buildings results in 0.5–1.0m³ of C&D waste and every 10 thousand m² construction process will produce 500–600 tons of C&D waste. The quest to reduce the influx

According to Jayakody et al (2019), aggregates from non-conventional material sources such as reclaimed glass, ash and fly ash, industrial slag, reclaimed asphalt and recycled concrete aggregates (RCA) are becoming very popular in the construction industry. Demolished

Waste management is one of the major challenges faced by municipality officials (Rajendrabhai et al, 2016), public health engineers and environmentalists in their quest to protect and preserve our environment (Ojuri, 2015) and therefore, C&D waste should be given a significant attention in order to manage and control it. Reutilizing the wastes as a construction material protects natural assets, saves energy, decreases solid waste and diminishes water and air toxic substance and cuts large quantities of greenhouse gases in the environment (Varaprasad et al, 2019, Onyelowe, 2019).

Effectively managed C&DW results in more benefits since it consist of numerous materials many of which can be recycled and reused (Ulsen et al, 2021). Recycling C&DW is only attractive when the entire

of C&D waste in our environment has led many researchers to champion advocacy on the re-use of wastes, and it is being practiced in several countries (Foye, 2011).

concretes are being recycled to produce recycled concrete aggregates (RCA) in different scales around the world, making it popular by replacing conventional materials (Jayakody et al, 2021 and Chalee et al, 2021).

recycled product is competitive with the natural sources in relation to quality, cost and quantity (Jayakody et al, 2018) and then the best option is to reuse the C&DW as construction material. The recycled C&DW aggregates could be alternative replacement to natural aggregates in concrete construction (Cristelo et al, 2016). Also in road pavement rehabilitation and reconstruction, failed recycled asphalt could serve as an alternative to crush rock and natural aggregate source. Currently, the use of C&DW is growing all over the world and has demonstrated sufficient promise for using as component in new concrete, asphalt, etc. However, it is not prevalent in most developing countries especially Nigeria.

SOURCES AND COMPONENTS OF C&DW

This category of waste is complex due to the different types of building materials being used but in general may comprise the following materials: C&D waste generated

from construction, renovation, repair, and demolition of houses, large buildings structures, roads, bridges, piers and dams (Reis et al, 2021).

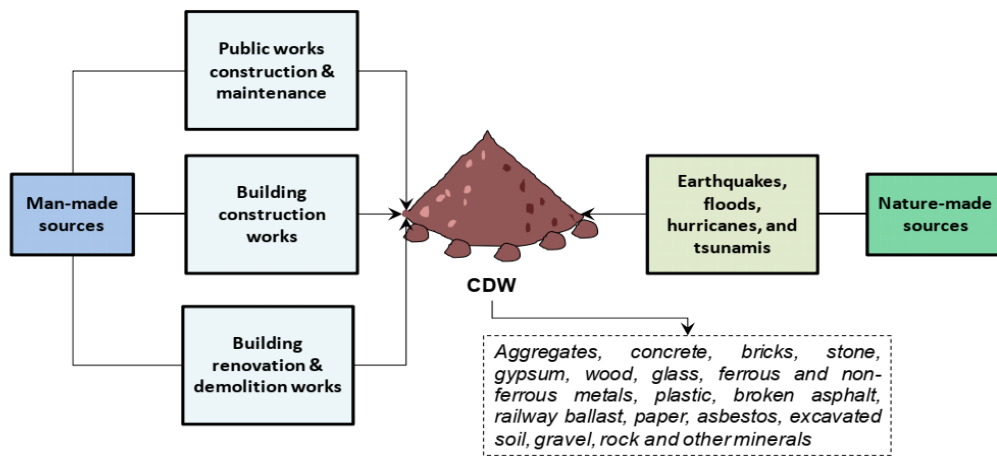
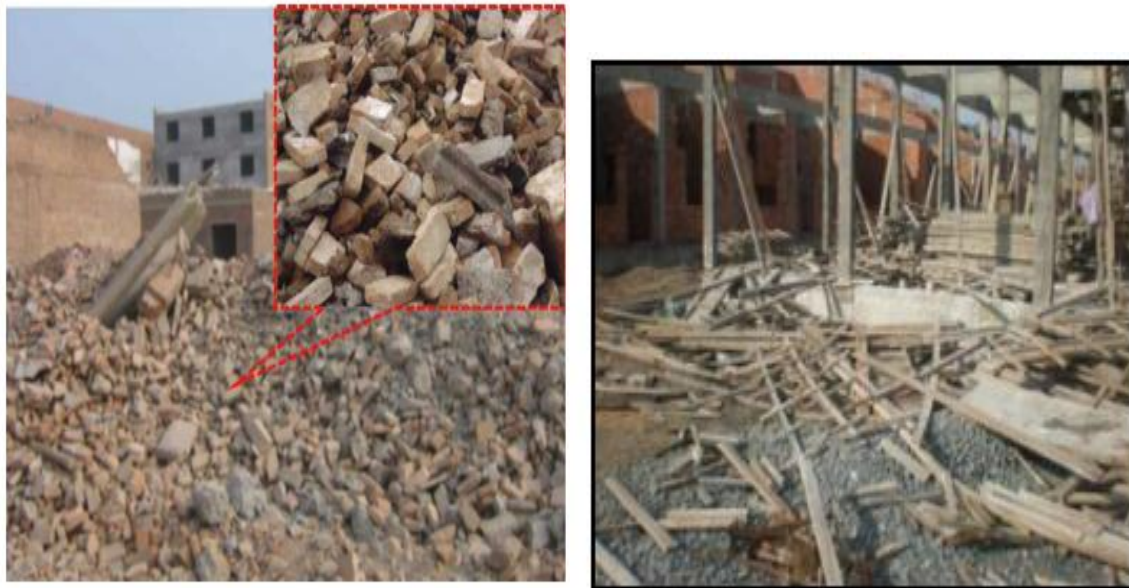


Fig. 1: Classification of Construction and Demolition Waste According the Source of Origin (Reis et al, 2021)



Fig. 2: Demolition Waste Along Trans-Amadi, Port Harcourt, Nigeria (Otoko, 2014)



(a)

(b)

Fig. 3: (a) Demolition Site (Li et al, 2017) and (b) Waste Timber on Site (Lee, et al, 2013)

The major components of this waste comprised timber/wood, steel, door/window frames, railings of staircase etc. Others include cement concrete, glass, plastic gypsum, stones (marble, granite and sandstone), bricks/blocks, plaster, metal, and asphalt etc. (Whittaker

et al, 2021), while the minor components include conduits (iron, plastic), pipes (iron, plastic), electrical fixtures (copper/aluminium wiring, wooden baton, bakelite/plastic switches, wire insulation), panels (wooden, laminated) and others (glazed tiles, glass

panes). Figure 1 classified C&DW according to their sources. C&D wastes from residential demolition sites

are shown in Figures 2 and 3.

ENGINEERING PROPERTIES OF C&DW

In recent years, numerous studies have attempted to establish a clear picture of the engineering properties of C&D waste to evaluate their suitability as construction materials for geotechnical applications (Henzinger and Heyer, 2017). There are certain specifications that are to be satisfied by the selected material to act as an effective

material in some geotechnical construction. Properties like hydraulic conductivity, strength characteristics, CBR, UCS, resilient modulus and index properties such as particle size, plasticity index, linear shrinkage and water absorption, has a general range of values to be satisfied.

Table 1: Physical properties of RCA (Jayakody et al., 2019).

Property	Values	
	RCA	Standard granular pavement material
Liquid Limit (LL) [%]	21.00	Maximum: 25 (MainRoads, 2010)
Plasticity Index (PI) [%]	5.40	Maximum: 6 (MainRoads, 2010)
Linear Shrinkage (LS) [%]	1.00	Maximum: 3.5 (MainRoads, 2010)
Water absorption (particles <4.25 mm) [%]	7.35	<10 (Arulrajah et al., 2013)
Water absorption (particles >4.25 mm) [%]	6.50	<10 (Arulrajah et al., 2013)
Specific gravity (Gs)	2.64	2.85 (Vegas et al., 2008)
Maximum dry density (MDD) [g/cm ³]	1.75	>1.79 (Arulrajah et al., 2013)
Optimum moisture content (OMC) [%]	13.20	8-15 (Arulrajah et al., 2013)
California Bearing Ratio (4 days soaked) [%]	90-95	>80% (MainRoads, 2010)

The physical properties of reclaimed concrete aggregates shown in Table 1 has exhibited Atterberg’s limit that conformed within the range specified for high quality concrete. Also the California bearing ratio (CBR) has

reportedly maintained high strength greater than the minimum standard specification for base course material used for high traffic pavement construction ((Jayakody et al., 2019).

Li et al (2017) investigated curing effect on the strength of C&D waste using UCS, CBR and deflection tests. The results show that the C&D waste has the characteristics of Otoko (2014) carried out a review on the use of construction and demolition waste in concrete and reported that a recycled aggregate concrete has better

high strength and significant stability after simple treatment and further suggest that the use of these materials for paving urban road embankments is feasible. resistance to carbonation than natural aggregate concrete due to its higher cement content to achieve a given strength.



Fig. 4: (a) Recycled Construction and Demolition Aggregates; (b) Natural Aggregates (Jayakody et al, 2018).

The research further revealed that abrasion resistance of recycled aggregate concrete using an accelerated abrasion method, led to a small difference in abrasion resistance (approximately 0.2mm) for up to 30% by mass of recycled aggregate as coarse aggregate. This result is

EFFECTS OF C&D WASTE IN THE GEOTECHNICAL PROPERTIES OF SOIL

According to Henzinger and Heyer (2017), the performance of soil improvement measures has to be evaluated from an earthwork engineering point of view using several parameters. These important properties include the plasticity, index, strength, density, and free swell index (FSI). Varaprasad et al (2019) examined the potential use of C&DW on expansive soil. The C&D waste used here was the combination of bricks, mortar, plastering cement from walls and roof which was recycled and mixed with soil at 5%, 10%, 15%, 20%, 25%. These combinations were tested for consistency limits, UCS

within text repeatability but below 30%, the difference is as much as 1mm. With the replacement of fine natural aggregate with fine recycled aggregate, there was an increase in resistance to abrasion. Figure 4a and 4b showed recycled and natural aggregates respectively.

permeability, etc (Oduola, 2010). Majority of previous studies have used laboratory tests to analyze the physical and mechanical properties of C&D waste, and they demonstrated its feasibility as a roadbase or subbase, while other theoretical reviews have established huge positive impact of recycled C&D waste on soil improvement.

and free swell index (FSI). Others include CBR and swell pressure test were conducted. According to the research, the liquid limit and plasticity index of the treated sample decreased with increase in C&D waste for all percentages as the C&DW is a non-cohesive and pozzolanic material.

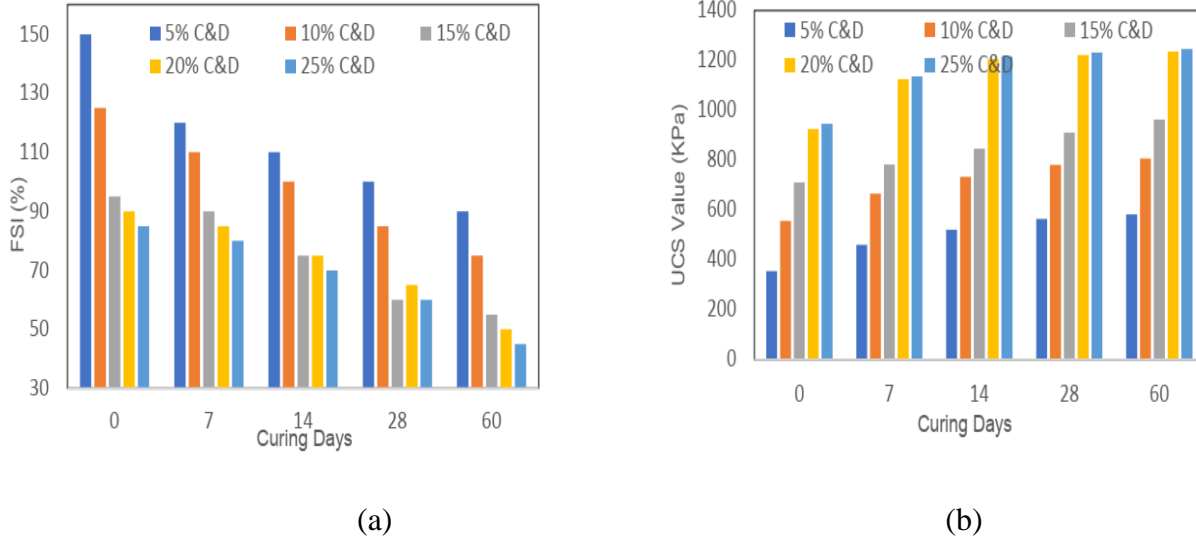


Fig. 5: (a) Variation of UCS value with Curing Period and Percentage Admixture, (b) Effect of FSI with curing days for CDW treated soil (Varapasad et al, 2019)

The investigation showed a great increment (4 times and 4.5 times) the UCS and CBR values of the untreated sample at 20% C&DW addition. The research also revealed a reduction in free swell index and swell pressure of the treated soils with increase in C&DW. The improvement in CBR value can be contributed to

the significant improvement in the UCS. Higher CBR values of C&DW-soil mixes enhance their potential for use as a subgrade and subbase for flexible pavement construction. Figure 5a and 5b showed the variation of UCS values and FSI with curing period and C&D wastes addition respectively.

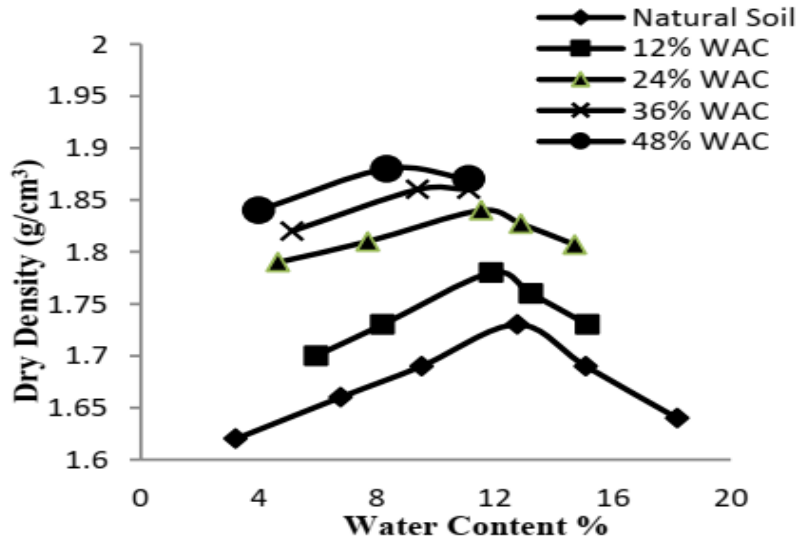


Fig. 6: Effect Waste Asphalt Concrete on the compaction parameters (Shubber and Alkizwini, 2018)

Shubber and Alkizwini (2018) investigated the use of waste asphalt concrete (WAC) on improving poorly graded sand subgrade soil. The test outcomes showed increase in dry density and optimum moisture content

with addition of WAC in different proportions as shown in Figure 6. The direct shear stress and the CBR value of the stabilized soil also increased with increase in WAC addition.

Patil et al (2020) investigated the viability of demolished waste (DW) from slab of a building in improving the strength of a black cotton soil. The study has shown a maximum improvement in load bearing capacity of the soil by 26.49% at 10% replacement with recycled DW. The research however reported a decrease in the bearing capacity by 61.897% at 30% replacement. This implies

A research conducted by Foye (2011) on the use of reclaimed asphalt pavement (RAP) in conjunction with ground improvement considered with the field observations on a given project suggested that RAP base courses can be readily constructed with properties comparable to similarly prepared virgin stone aggregate base courses. The research further revealed that the

Henzinger and Heyer (2017) performed an experimental study on the improvement of soft, fine-grained soils using recycled aggregates from demolition waste. Nine soil samples were treated by adding up to 50 % mass of

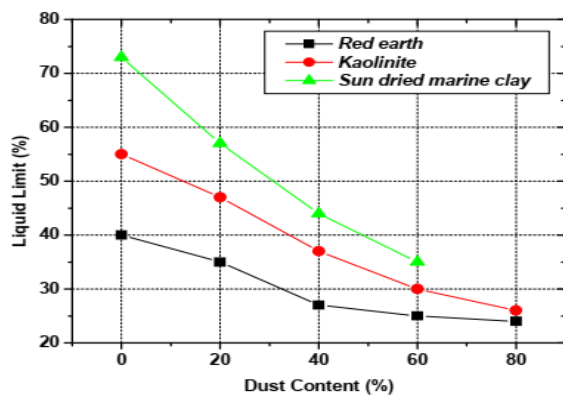
Devarajan and Sasikumar (2015) conducted an investigation on the suitability of marble dust-soil composite as landfill liner material. The results obtained from the mixture of marble dust and kaolinite clay revealed a liquid limit value reduction from 47% for 0% marble dust to 43.1% at 5% marble dust

that average optimum value of DW required is 10%. Also, Neekhara and Saxena (2017) worked on the same type of soil using C&DW and Marble Waste Powder (MWP) and revealed that the experimental results showed a significant improvement in the engineering properties of the black cotton soil when treated with C&DW and MWP individually.

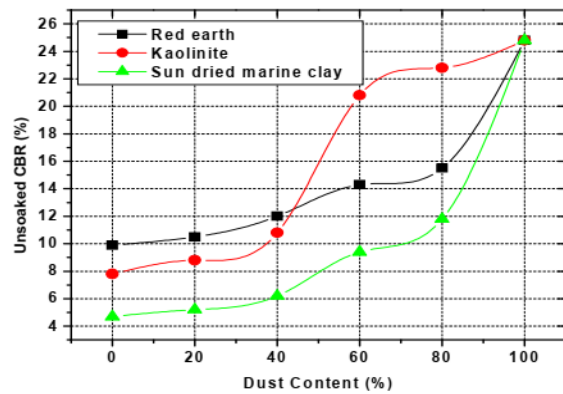
successful application of geogrid reinforcement in conjunction with the RAP base aggregate allowed the timely completion of the project with high-quality results, and that the project was successfully concluded at a cost (about \$200,000) that is significantly less than the original specification (about \$890,000) for unacceptable subgrades.

this dry and porous waste. For these mixtures, the result of the improvement was observed to be most successful for soils with liquid limit (LL) $\leq 40\%$ and increased with a decreasing LL.

addition. They observed a gradual decrease in the liquid limit with minimum value obtained as 40.7% for 20% marble dust addition. Also, the plastic limit increased from 25.3% (for untreated soil) to 34.1%. After which, the increase was gradual and a maximum value of 36.7% was recorded for 20% marble addition.



(b)



(a)

Fig. 7: (a) Influence of Dust Content on Liquid Limit of Soil, (b) Influence of Dust Content on CBR Value (Kano and Kalita, 2014).

These results indicated a decrease in plasticity index and geotechnical property of the treated soils as expressed in increase in CBR value with consequent improvement on the Figure 7.

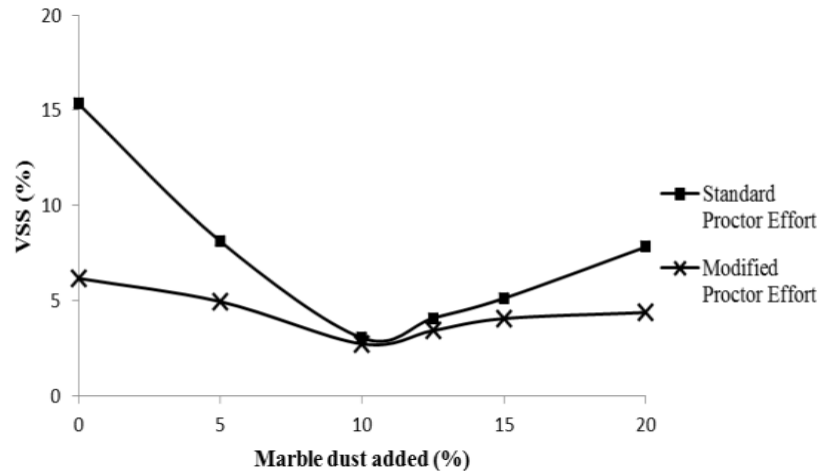


Fig. 8: Variation of the Volumetric Shrinkage Strain with Marble Dust Addition (Devarajan and Sasikumar, 2015).

Standard compactive effort and the volumetric shrinkage strain (VSS) decreased from 15.3 % at 0% marble dust addition to 3 % at 10% marble dust content as shown in Figure 8. A reverse in this trend was observed when the VSS increased to 4% at 12.5% marble dust addition. The

Sivrikaya et al (2014) performed an experimental work to compare waste calcitic marble, dolomite marble and granite powder as additive for the stabilization of clayey soil. They prepared an artificial soil samples in the laboratory using bentonite and kaolinite. Natural stone waste powder was added to the soil samples at different percentages. The results showed a decrease in plasticity index of the clayey soil for increase in percentage additive and the physical properties of the soil changed from clay to silt. A decrease in optimum moisture content and increase in maximum dry unit weight were reported with dolomite marble powder exhibiting the lowest optimum water content and the highest maximum dry unit weight. The study showed a 9% decrease in the plasticity index of the samples with 5 % dolomite

Feasibility of using C&DW fine fraction and bentonite mixtures as alternative landfill barrier material was investigated by Correia et al (2020). It was revealed that the hydraulic conductivity of the C&DW fine fraction increased from 1×10^{-5} m/s at 0% bentonite content to

Cristelo et al (2019) undertook a research on geotechnical and geoenvironmental assessment of

development was as attributed to increase in fines with large surface area present in the soil mixture that needed more water at corresponding OMC to stimulate reaction. This has led to high shrinkage during drying.

marble dust addition and 50% decrease with 66% marble dust content. Also undrained consolidated compression (UCC) strength test carried out on the compacted mixture at optimum moisture content, recorded an increase from 227.2kPa for 0% marble dust to 409.4kPa for 5% marble dust and 775.6kPa for 12.5% marble dust addition. A reduction in the strength to 661.1kPa was obtained at 12.5% marble dust content with modified standard Proctor effort. The increase in UCC strength was attributed to the bonding of calcium ions of marble dust with silicates or aluminates present in the soil, while the decrease in strength can be related to the availability of excess pozzolanic material which remains unbonded with soil.

1×10^{-9} m/s for 16% bentonite addition. The research also affirmed that the used of C&DW fines as alternative liner material could provide efficient reductions of natural clay while mitigating the pollution and environmental impact of C&DW.

recycled C&DW (originated from demolished family houses) for road embankment and concluded that the

C&DW batch was environmentally sound and in accordance with the limits imposed by the European Directive 2003/33/EC. They also classified C&DW as an inert material with mechanical behaviour consistent

CONCLUSION

This paper has reviewed that recycled C&DW can be effectively utilized to improve the geotechnical properties of soil. Having recorded positive effect on the geotechnical behaviour of soils, engineering properties such as Atterberg's limits (liquid limit, plastic limit, plasticity index, and linear shrinkage) has reportedly improved through the use of recycled C&D waste as additive to weak and unsuitable soils. Other properties such as California bearing ratio (CBR) value, unconfined compressive strength (UCS), free swell index (FSI), volumetric shrinkage strain (VSS), as well as optimum moisture content and maximum dry density has greatly enhanced using C&D waste for soil improvement. The various problematic soils reviewed in this paper, such as poorly graded sand, kaolinitic clay,

to that of natural soil and also, have exhibited strength and elastic stiffness values comparable to those possessed by a natural granular material with the same particle size distribution.

mineral clay, black cotton soil, silt, red earth, etc have responded positively in terms of their geotechnical properties when treated with recycle C&DW at varying proportions. In this paper therefore, recycled C&DW such as ceramic dust, reclaimed concrete aggregate, waste asphalt concrete, marble dust, etc have shown high potentials when used as stabilizing agents for road pavement layers, landfill liners, foundation soils, etc. This practice of waste recycling and utilization is however backward in most developing countries especially Nigeria. As potential alternative to the use of natural aggregates, reuse of C&D wastes should be promoted all over the world to help conserve the natural resources, save economy/energy and reduce the hazards posed by C&DW in our environment.

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