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EFFECTS OF CEMETERY LANDSCAPE ON NEIGHBORHOOD AND VEGETATION COVER IN GOMBE STATE, NIGERIA

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ABSTRACT

Purpose: *Cemetery Landscapes are frequently referred to as cultural landscapes that represent a fundamental storehouse of the natural and cultural capital of the earth. Cemeteries contribute to these storehouses and therefore deserve increased attention, understanding and preservation. The study assesses the effects of cemetery landscape on the neighborhood and vegetation cover within the cemetery environment with a view to find out the changes that are taking place in the neighboring environment for proper planning in Gombe State. The objectives of the study include evaluation the impacts of cemeteries landscape on neighboring settlements and examining the effect of cemeteries landscape on vegetation.*
Design/methodology/approach: *Both qualitative and quantitative data were used, 400 respondents were selected for the purpose of this study and were distributed proportionately based on the population of each LGA. The instrument for data collection included GPS, structured interview and questionnaires. All cemeteries in the LGA headquarters were visited.*
Findings: *The results of the study revealed the impacts of cemeteries to the neighborhood as modifier of micro-climate, store house of rare species of plants and animals; it is a place of deposing dead bodies and a place of memorial ease of corpse conveyance. Others included insecurity, land devaluation and psychological discomfort, change in ground water taste, change of neighborhood structure that generate land use conflicts especially with residential areas, it also leads to loss of initial landscapes, loss of agricultural land.*
Research limitations/Implications*: The limitations include the use of only cemetery areas neglecting other burial places like domestic and church compound graveyards.*
Practical implications: *The study recommended the need to provide adequate facilities within cemeteries to facilitate smooth conduct of burial activities. The burial at home reduces the value of properties hence the study recommend burial at the cemeteries.*
Originality/value: *The study revealed that both Islam and Christianity attached sacred value to cemetery and burial ground which affect economic value of land in the neighboring surroundings.*

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Key words: Cemetery, Gombe State, Landscape, Neighborhood, Vegetation,

1.0 INTRODUCTION

Generally, cemetery is discussed from two different perspectives: as a public resource and as a problematic land use (Uslu, 2010). In terms of public resources; it serves as place of memorial of deceased for those who are alive, it is a place of deposing of dead bodies, it is a peaceful place where people visit to contemplate their lives, it serves as a habitat to rare species of plants and animals, short stay for recreational, social and cultural heritage, fuelwood logging etc. While the problematic aspect of cemetery; destruction of biodiversity, contamination of ground water, environmental degradation, property devaluation, permanent land wastage, spiritual and psychological disturbances among others. Nita, et al. (2013) asserted that, the poor management of burial places has increased the negative environmental deterioration of the cemeteries upon other land uses. There is paucity of research, focused on natural or anthropogenic patches located within the urban matrix like cemeteries (Tanaka, 2017). It has been suggested that cemeteries located within artificial landscape matrices (i.e., human built system such as cities) and natural landscape matrices, represent model system in which to investigate the relationship of biotic and cultural diversity to patch matrix elements at different spatiotemporal scale (Neckel et al., 2016). The neighborhood to cemeteries experiences various psychological feelings leading to many problems such as desertion, low rent, low land value, low patronage in businesses etc. because of the sacred nature of the place. Rodriges and Pacheno, (2003) and Zume, (2011) have identified cemeteries as areas with potentially high level of biotic diversity, especially within human built landscape matrix. In California (USA) for example, Alexandra (2012) identified cemeteries as important sites for the conservation of plant species characteristics of the grassy white-box woodlands.

Studies related to landscape and environment relationship that are tilted toward cemeteries were conducted in different parts of the world particularly Europe, America and Asia. From the findings available so far indicates it has not been adequately done in Africa and Nigeria. Apart from the lack of space and overcrowding within the cemetery, the migration of people from rural to urban environment throughout the last few decades has also contributed to the escalation of population in urban centres which necessitates the need for space that cater the needs for markets, schools, sport and events fields, housing and cemetery for burial (Zume, 2011). This problem has been exacerbated by the conventional practice of Muslim and Christian burial rites as well as lack of comprehensive planning and managing urban cemeteries by local authorities (Zume, 2011). Livable city and town must not only care for the wellbeing of the living, but both the living and the dead (Raza & Alfa, 2012). With the growing population, the issue should not be taken lightly as it could become a potential threat to the society in accommodating sufficient burial spaces in the near future. As an example, the issue of burial space has reached the climax in many towns and cities in the world like in Kuala Lumpur (Malaysia), Jakarta (Indonesia), Brasilia (Brazil), Tokyo (Japan) etc. (Rodriges & Pacheno, 2003; Raza & Alfa, 2012; Neckel et al., 2016). Therefore, it is necessary that these sacred places/spaces are reexamined in order to redefine the role as well as the potential risks of cemeteries in the societies and the biodiversity they accommodate.

Landscape is part of the earth surface that can be viewed at one time from one place. It consists of geographical features that mark or are characteristic of a particular area (Sitwell & Bilash, 2016). A natural landscape is made up of a collection of landforms, such as mountains, hills, plains and plateaus. Lakes, streams, soils (such as sand or clay) and natural vegetation are other features of natural landscapes (Sitwell & Bilash, 2016). A landscape that people have modified is called a cultural landscape. The people and

plants they grow, the animals they rear, the building they raise among others make up the cultural landscape. They can be vast as cattle ranches, cemetery landscapes, urban landscape, play grounds etc. Since 1992, the United Nations recognized significant interaction between people and the natural landscape as official cultural landscapes (Tanaka, 2017). Cemetery landscape is an associative cultural landscape for many African people in general and Nigeria in particular (Tanaka, 2017). It is not generally recognized that significant fraction of the diversity of plants and small animals of the earth reside in human-influenced landscapes, frequently referred to as cultural landscapes that represent a fundamental storehouse of the natural and cultural capital of the earth (Marcomini, 2012). Cemeteries contribute to these storehouses and therefore deserve increased attention, understanding and preservation. The aim of this study is to ascertain the effect of cemetery landscape on neighborhood and vegetation cover within cemetery environment with a view to find out the changes that are happening to the neighboring environment for proper planning purpose.

2.0 LITERATURE REVIEW

Geography of the dead is the study of burial and material culture elements found on the landscape of the dead popularly known as necrography and sometimes use to address the field of geography, studying geography death. Kong (1999) who by reviewing necrogeographic studies from the 1999s found that the field to a large extent reflects and contributes to other discipline of geography. One way of describing areas associated with dead in a geographical context is to bring in the concept of landscape by using the term deathscape. Geographical studies not only use the expression deathscape for landscape where dead bodies are cremated or buried, but also for landscape where people have died and where this is expressed in the landscape Erikson (2010). A Geography approached to the study of cemeteries is exemplified by Price (1966), as he recognized the study of William D Pattison's 1955, "The cemeteries of Chicago: A phase of land Utilization" as the first paper of the subject to appear in an American geographical journal. Pattison pioneered study treats the special considerations and problems besetting cemeteries in an expanding city: the rise of profit motivated cemetery's anachronistic locations, municipal controls, and specialization based religious, national, and other ground.

Burial site and mortuary practices along with funerary rituals, have been the major focuses of crosscultural researches since early foundation of social science (Hertz, 1960, Van Gennep, 1960, Frazer, 1963, Turner, 1969, Bloch and Parry, 1982) in Fogli (2004) and later environmental sciences (Santarsiero *et al*. 2000, Spongberg and Becks 2000a; 2000b in Fogli (2004)), which considered cemeteries as a threat to public health.

Modern protected area management advocates the need for a better understanding of the dynamics of vegetation changes and the underlying drivers of such changes. The emphasis is on the interaction between natural and anthropogenic-led factors, which hitherto, have been studied using different techniques. The relationship between man and his environment manifesting in his quest to maximize the utilization of the nature's endowment to meet his ever-growing needs, has altered the landscape resulting in an action-reaction scenario that continue to adjust and readjust in space and time with serious consequences on the nature's life supporting systems Fogli (2004).

The study looked at the cemetery landscape (protected area) as an ecosystem (with various components interacting together) that provides services to humans (through provision: shelter to dead bodies, food/fodder to animals, sanctuary to birds, hidden place to small animals, medicine, fiber and fuel; regulating: flood control, microclimate; and cultural aesthetic), and is being impacted upon by human activities and other drivers such as rainfall; and the policy decision on nature management that controls access and right to use the protected area. These complex interactions obviously could have feedbacks. Thus, this study adopted the frameworks by the economics of Ecosystems and Biodiversity study (TEEB)

(De Groot et al., 2010a) and Haines Young and Potschin (2010) as modified by Fogli (2004) for the analysis of ecosystem services in the context of Millennium Ecosystem Assessment (Raza & Alfa, 2012), which was itself based on a Driver, Pressure, State, Impact Response framework.

3.0 STUDY AREA Location and Size

Gombe State is one of the 36 states of the Federal Republic of Nigeria, it was created in 1996 from Bauchi State, and is located in the Centre of the north east of the country. Gombe State occupies a total land area of about 20,265 sq. km. It is made up of eleven (11) local government areas namely Gombe, Yamaltu/Deba, Billiri, Kaltungo, Ballanga, Akko, Dukku, Nafada, Shongom, Funakaye, and Kwami (located between Latitudes 10^0 15'00" and 11^0 10'10" North and Longitudes 8^0 45' and 11^0 45' East. It shares boundaries with Yobe State in the north, Borno State in the east, Adamawa and Taraba States in the south and Bauchi State in the west (fig. 1).

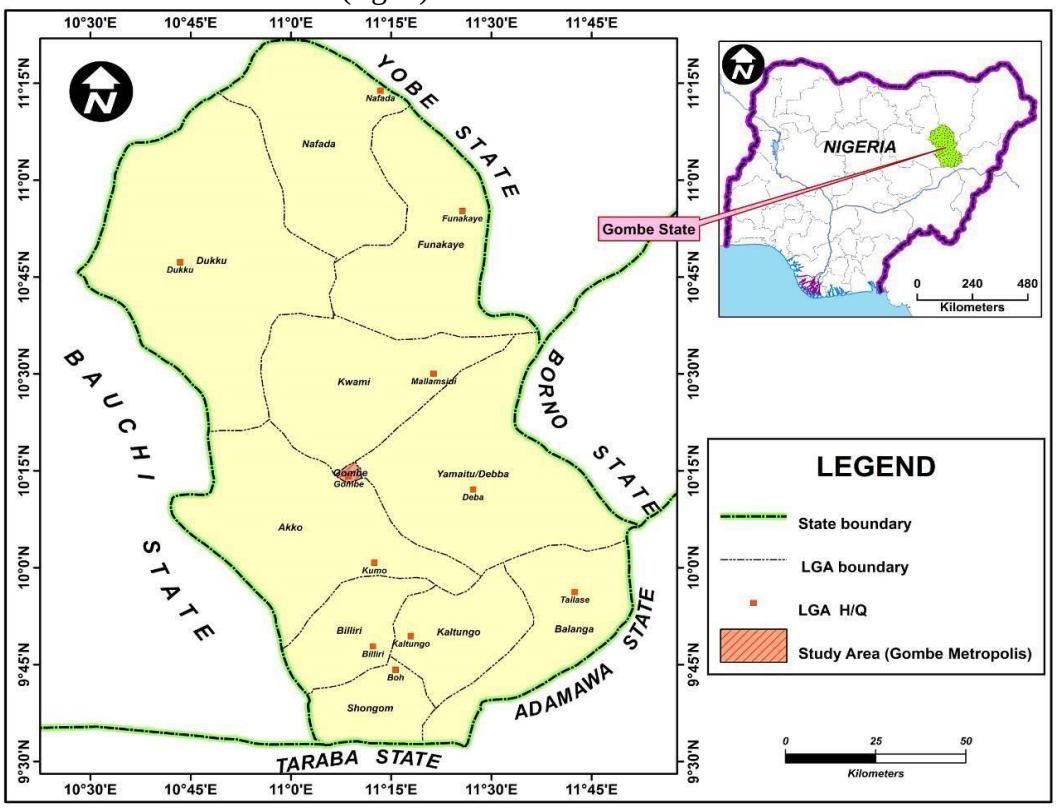


Figure 1: Study Area.

Source: Cartography Lab Gombe State University (2019)

Based on the 2006 national population census, it has a total population of 2,365,040 and a projected population of 3,393,807 in year 2024 (Table 1) (National Population Commission, 2006). These ethnolinguistic composition of Gombe urban area includes among others; the Fulani, Tera, Bolewa, Tangale, Jukun, Pero, Hausa, Kanuri, Yoruba, and Igbo. In addition, all these various languages, Hause language serves as the linga-franca in the course of daily interaction among peoples. English language remains the official language as obtains in all parts of the country (Abbas, 2012).

The State is nationally known for its agricultural potential and some 80 percent of the population are rural and engaged in farm work. After agriculture, commerce is the next most important economic activity. Only a relatively small proportion of the population engages in manufacturing of goods and services Gombe State Diary (2018).

The mean maximum temperature of 37^{o}c is recorded in March-April and the minimum monthly temperature is about 21^{o}c (Abba, Shehu & Abba, 1999). Gombe State is part of the central Nigerian highlands; but the flat landscape in the northern and southern parts of the State have isolated hills. While the elevation of the plain is at about 600m above sea level, the hills reach between 700m and 800m (Zaborski et al., 1997 quoted in Abba, Shehu & Abba 1999).

Gombe State is located within Sudan Savanna ecological zone. It has scattered trees in open grassland with short grasses (under 1.2m tall) which co-dominates the area. The trees are usually characterized by broad canopies and they are seldom taller than 20m. The trees are well adopted to the environment (Mbaya, 2012). Rainfall is available in few months in the region, as such majority of the species are deciduous and only few are evergreen e.g. *Tamarindus indica*. Vegetation in Gombe State is predominantly wooded shrubland in the central part, with the plant community comprising Anogeissus/ Combretum/ Affrormosia/Detarium (Mbaya, 2012). The northern part of the State exhibits a mosaic of shrubbed grassland and grassed shrubland with the preponderance of *acacia*. In the hilly southern areas, the vegetation is shrubbed woodland with mostly Affrormosia and Detarium.

4.0 METHODOLOGY

Quantitative and qualitative data were used for this study. Survey of cemetery landscapes (cemeteries sites, graveyard, churchyard and burial ground), inventory of plants species within the cemetery, distance between cemeteries, date of establishment, number of grave yard and cemeteries as well as their size and coordinates. Distance of cemeteries from town, distribution of places of burials (active and inactive) and their distance apart have been measured quantitatively. Two sources of data are having been utilized in this study; Data concerning location, area cover and coordinates were collected using GPS, changes in cemetery condition like size, site, types, internment space, round surface condition, fenced or not, gated or not, grave arrangement, etc.

The instruments and tools used for this study include; Global Positioning System (GPS): has been used to capture coordinates of various locations of interest (all urban cemeteries), ArcGis 10.2 version: has been used for mapping and spatial distribution of cemeteries, Digital camera: has been used to take pictures of cemeteries and associate material, Notebook: has been used to record responses, interview guide and questionnaire. Tape recorder to record audio voices of respondents during interview as one cannot write down everything.

The data on Cartesian coordinates (longitude and Latitude) and the size of cemeteries have been employed for Nearest Neighbor Analysis (NNA) using ArcGIS, Surfer and SPSS software version 26. Nearest Neighbor Analysis (NNA) of various cemeteries across the study area have been displayed with ArcMap in ArcGIS at polynomial (X^{n}) regression levels where n=1, 2, 3, 4, 5, .as the case may be.

Distance of grave yard and cemeteries, from residential, and religious places, has been measured with ArcGIS ruler. Similarly, the aerial coverage of those places (burial grounds) has been calculated using google earth. With that data, Nearest Neighbor Analysis (NNA) computation has been carried out through the use of total area and the distance between those places.

Simple percentage, Chi-Square (One tail T-test) and One way Analysis of Variance (One way ANOVA) has been used to run multiple comparisons for least significant difference and the results was presented in narrative form as well as tables, pictures, graphs and charts.

5.0 PRESENTATION AND DISCUSSION RESULTS

Out of the 400 copies of questionnaires distributed, 360 were able to meet and analysed. This represents 90% of the total expected responses, a proportion judged quite adequate. The interview conducted and the questionnaires results or responses from the respondents revealed that majority of people involved in the funeral related activities are men, almost hundred percent of the respondents who were involved in the handing procurement of cemeteries, maintenance, graves digging, corpse internment, cutting of wood logs for covering of graves, conveyance of dead bodies to final resting place either in the house or in the cemetery, among others.

5.1. The Impact of Cemetery Landscape on the Neighborhoods

The impact of cemeteries to the neighborhood can be viewed from negative and positive perspectives. The positive includes modification of micro-climate, store house of rare species of plants and animals; it is a place of deposing dead bodies and a place of memorial ease of corpse conveyance. The negatives aspects are insecurity, land devaluation and psychological discomfort, change in ground water taste, change of neighborhood structure that generate land use conflicts especially with residential areas, it also leads to loss of initial landscapes, loss of agricultural land among others (Table 1). These findings are in concomitance with Rodrigues and Pucheco (2003) in USA, Kingsley (2013) in Rivers, Olajide *et al*, (2013), whose carries out a research in Lagos also found that cemeteries have both negative and positive impacts such as loss of vegetation cover, ground water contamination, development of harmful substance, insecurity, bad odor, property devaluation among others.

The location of cemetery in any given place depends on the historical, cultural and religious belief of that society. In the past, people used to bury their decease at home, even though in Gombe State Christian and village settlers are still practicing it. Due to change of settlement patterns, lack of space, more Islamic and Western knowledge and integration of cultural values in most urban centers, people now tend to change old methods of burying dead bodies inside houses, *hizare* (mosque compound) and church yard to a dedicated place called cemetery.

All the eleven local governments visited there is one or more functional cemetery where people bury their dead. It has been discovered that out of the 11 Local Governments in Gombe State, only four LGAs have active Christian cemetery (Gombe, Billiri, Kaltungo and Shongom) where graves have been seen on a cemetery. It is in Shongom (Boh) that Muslims did not have cemetery. This is connected to the population of Muslims in the area which is dominated by Christian faithful. Some cemeteries are enclosed within settlements more especially in Gombe, Bajoga, Kumo and Talasse towns. Other cemeteries are located at the periphery of the town that is immediately after the last house in a town therefore, in the nearer future it would be subsumed by human settlement due to population increase and urban expansion. Nita *et al*., (2013) and Inuwa (2019) indicated that cemeteries have negative impact to the neighboring environment in terms of physical, social, location and environmental value. Therefore, this impact cannot go unnoticed by people living within those areas.

Table. 1: Negative Impact of Cemetery to the Neighborhoods

Negative parameters	Number of Respondents	Percentage (%)
Insecurity	65	18.0
Property Devaluation	39	10.8

Bad Odor perception	32	8.8
Disturbance by Animals	30	8.3
Psychological Trauma	40	11.6
Harboring of Harmful Organism and Diseases	65	18.0
Reduction to other Land Uses	23	6.3
Change of Water Teste	24	6.6
Effect of Vegetation	42	11.6
Total	360	100%

Source: Fieldwork, 2020

It is therefore highly important to highlight the impact of cemetery on the neighborhood as discovered during the field work. During the interview with some respondents, the following impact of cemetery on the neighborhood were revealed and discussed as follows;

Insecurity

Some participants during the interview explained that cemeteries serve as a hidden place for criminals especially in fenced, or areas that are not adequately managed. Reported and unreported cases of criminal activities were identified at cemeteries and places near the cemeteries such as theft, smoking Indian hemp, vandalism, rape etc. because of inadequate security personnel to patrol the place. This is the reason why most people did not want to reside in areas near the cemeteries unless where necessary according to some respondent. During the interview, one of the respondents close to Kumo central cemetery indicated that, security is a crucial issue that is bedeviling them as most of the security personnel did not approach the places during night patrol.

The interview revealed that less than of the respondents 65 (18%) attests to the fact that security challenge is the main issue within their surrounding (cemetery neighborhood) (Table 1). It was discovered that police and local vigilante group pay less attention to cemetery areas during patrol, this gives room to hoodlums a chance to operate freely. As buttressed by some respondents, some of the neighborhood close to the cemetery leaves their houses due to incidence of insecurity in places like Jekada Fari, Anguwar Tike in Kumo, Anguwar Makabarta in Bajoga and Hurmin Da'u area of Gombe. Hoodlums normally established camp inside cemetery where they take hard drugs, cigarette, tutolin, solution (*sholisho*) and Indian hemp from there, they move to the neighborhood to perpetrate crime as reported by the respondents. This finding was supported by Olamide *et al.,* (2013) in Lagos who reported high incidence of criminals' hideout in many cemeteries in Lagos. Kingsley (2013) also reported that a visit to five cemeteries (Port Harcourt City, Bonny, Okirika, Degema and Ahoada East

LGA) show that they are situated in town or semi-urban areas. This gives room for criminal's hideout and resulted to prevalence of insecurity around the cemetery environment in Rivers. Inuwa (2019) also reported the incidence of insecurity around Gyadi-Gyadi cemetery where criminals use ladder in the night to jumped into people's houses and steal their belongings and keep the ladder inside cemetery for next operation. The respondents recommended the establishment of Tsangaya schools in areas close to cemeteries to make the place busy and lively as well as secured. Their findings are in concomitant with this study.

Property Devaluation

Another issue that is related to the impact of cemetery on the neighborhood is devaluation of properties. This has to do with land value, rent value in relation to the location of cemetery in terms of buying, selling and renting of property. Properties (land, house, shops etc) close to cemetery are usually having less value from people eye regardless of whether you are buying or selling. Close to half of the respondents 39 (9.75%) attest to the fact that, the value of property is decreasing with closeness to the cemetery environment. As pointed out by some respondents a shop at Jekada Fari along Abacha Street is less costly compared to properties located a little bit far from the cemetery. At the time of interview with a generator mechanic who rented a shop at behind Specialist Hospital Gombe which is close to the cemetery stated that "I have paid the sum of ₦ 30,000 only per annum because people do not want to reside here due to the proximity to cemetery".

But a little far from there another shop owner stated that he is renting a shop at the cost of ₦ 60,000 per annum, twice of those who are living close to cemetery. This statement was corroborated with the findings of Inuwa (2019) in Kano where the same scenario was reported in various areas near cemeteries in Kano metropolis. For example, in Kuka Bulukiya and Rikwa cemeteries most of the prices of shop and houses rent are lower compared to faraway places. One of the respondents in Bajoga explained that most of the houses near the cemetery are lower income earners who used to buy plots of land at cheaper rate in areas close to cemetery to build a house because of unattractive nature of property in those places. This assertion were in harmony with what is obtainable in some cities like Kano where wealthy individuals are avoiding building houses close to cemetery in many instances (Inuwa, 2019). It has been discovered that people find it difficult when selling their properties in areas near cemetery.

Bad Odor Perception

Less than half of the respondents (9.5%) who reside near the cemetery expressed their worries on the existence of unpleasant odor (Table 2). Areas like Jekada Fari, Hurumin Da'u, Yerima Quarter, Wuro Juli and Galdimari all in Gombe urban area have reported the unpleasant odor from time to time in their areas as a result of either rupture of graves due to rainfall or animal that grazes in the cemetery or as a result of waste disposal by neighborhood. The findings are in harmony with Inuwa, (2019) where he reported the incident of bad odor around Kuka Bulukiya and Rikwa cemeteries in Kano Metropolis. He reported that residents near the cemeteries are complaining about unpleasant odor that emanated from the cemetery as a result of waste disposal. Furthermore, insanity, poor management, urination of people, disposal of human excreta around the cemetery site, disposal of animal carcasses like dead cats, goat, sheep, rodents, hens, animal dungs and burning of waste materials are identified as the agent that compounded the odor around the study areas. The aforementioned agents may pose harm and cause threat to the health condition of the neighborhood, passersby and the visitors of cemetery.

Disturbance by Grazing Animals

The next issue of concern to the neighborhood of cemeteries is animal grazing inside cemetery especially unfenced cemeteries. The result of the interview conducted revealed that 9.8% of the respondents complained about the issue of animal grazing around the cemetery area (Table 2). One of the respondents disclosed that stray animals are common in cemeteries in the study area like cattle, goat, sheep and reptiles. This is due to the present lush of vegetation. This has effect to the neighborhood because animals sometimes are uncontrollable, they can jump into nearby houses to eat what is available and disturb people

around. This issue was also reported by Inuwa (2019) in Kano where the incidence of cattle rearing was seen around the neighborhood and it causes harm to the settlers. It was discovered that different reasons may lead to attraction of animals into the cemetery environment such as grasses in the case of cattle and sheep, shrubs in case of goat, cats may look for rats, rodents and small reptiles, dogs are looking for preys and so on. According to respondents' cattle, rats, cats and reptiles are the most common animals that sneaked into the neighboring houses. A female respondent indicated that rat cat and reptile are common animals that disturbed them especially in the night hours. She added that this is one of the disadvantages of residing in areas close to the cemetery. Thus normally, people are afraid of stray animals as they may be aggressive and their status are potentially vectors that can transmit various infection, or they can be venomous that can kill or maimed people.

Harboring of Harmful Organism and Risk of Disease Infection

The result of the questionnaire revealed that a significant number of respondents (18.5%) explained the existence and development of harmful organisms such as snakes, scorpions, ratus-ratus, insects, alligators, lizards, termites, ants, bees among others that are dangerous to people (Table 2). It was observed that due to the bushy nature of some cemeteries in the area, particularly those that are not sanitized, rats, insects, scorpions, termites and pests exist rampantly and they can easily move into the surrounding neighborhood and cause harm or injury to the people around the area. These findings are in concomitant with the findings of Olamide (2013), in Lagos, Kingley (2013), in Port Harcourt and Inuwa (2019), in Kano, in their separate studies they discovered that residents near cemeteries are complaining about the high incidence of harmful organisms like snakes, scorpions, rats, etc. Some of the respondents' express concerns due to increased number of mosquitos, more especially during the rainy season due to the presence of shrubs and grasses within the cemeteries.

> "*Grasses harbor mosquitos and once it is night, they started spreading into the neighborhood. Rodents and termites are also in existence and they can build ant hills inside houses thereby causing damages to anything nearby as highlighted by a female respondent at Anguwar Makabarta in Bajoga town".*

Some of the cemeteries in the study area are not properly taken care of hence look like bushy area more especially those in Gombe, Bajoga (Funakaye LGA), Nafada and Boh (Shongom LGA). Cemeteries are a breeding ground for insects and termites that can move freely around the neighborhood and spread infectious diseases more especially mosquitos and tsetse flies as buttress by some respondents. A reasonable number of respondents confirmed the existence of potentially infectious causative agents within cemeteries neighborhood. A respondent in Talasse (Balanga LGA) stated that, "Cemeteries are considered to be micro-biologically contaminated sites represent a perceived issue that affect people especially those who live in areas near the cemetery environment" He further suggested that proper management of cemetery environment through community service of quarterly sanitation would help tremendously in averting or decreasing the incidence of diseases. This finding is in harmony with Uslu, (2010) who revealed that, cemeteries are a source of infectious diseases in Bucharest, Romania, where close to half of the respondents 42% during his study attests that cemeteries are a source of infectious disease.

Psychological Trauma

Sizeable number of the participants during the field study has expressed fear and psychological discomfort due to the closeness of cemeteries to the residential buildings in the area. It has been discovered that

women and children are more vulnerable in that problem because they are usually at home when people escort corpses to cemetery for funeral and final internment which happen normally during the day time. Their attention and thinking most of the time will be prevailed to the cemetery due to the nature of the area. During the night a strange movement worries and disturbed their mind and cut their sleeping. There is superstitious belief by Hausa-Fulani about the existence of evil spirit (*Fatalwa*) in a cemetery and sometimes whenever someone gets sick or suffers from illness related to lunacy, it will be ascribed as evil spirit from the cemetery as expressed by the respondents. The same scenario was reported in Kano by Inuwa, (2019) in his findings "Traditionally, Hausa living communities make rumor of the existence of evil spirit in a cemetery environment and sometimes when people around the neighborhood get sick it can be linked to that evil spirit. In that case, spiritual problem is one the issues that disturbed cemetery neighborhood. During interview session, a significant number of the respondents (12.5%) expressed their concern on psychological issue as a result of residing near cemetery environment (Table 2). According to some respondents, fencing of cemetery had help to reduce fear and psychological imbalance among people living within the vicinity. They lauded the government for taking good step in fencing cemeteries in some areas. People at the close vicinity of the cemetery remain indoor immediately at sun set and the area might appear quiet and lonely creating psychological disturbance, thereby affecting social interaction of people in the area. This finding was supported by Neckel et al., (2016) who reported that neighborhood to cemeteries experiences various psychological feelings leading to many problems such as desertion, low rent, low land value, low patronage in businesses etc. because of the sacred nature of the place.

Effects on Other Land Uses

Almost all cemeteries visited in the study area were formerly farmlands and later converted to cemeteries. It has been discovered that majority of the cemeteries were emir's or chief's farmland that were either earmarked free of charge or sold to community, government, religious sects or individuals. Results from the interview conducted revealed that less than half of the number of respondents (6.5%) (Table 2) confirmed that one of the impacts of establishing cemetery in an area is the loss of valuable agricultural land, settlement, recreational facilities, commercial land, games reserves and other land uses. Most of the cemeteries are located at the periphery of the towns and mostly peripheral land is fertile (rich in soil nutrient) due to deposition of waste materials from the nearby houses as well as defecation by people and animals. Most of the new developments in the town like schools, hospitals, barracks, recreational fields and new GRA houses were built at the periphery, but when cemetery is located close to the settlement, it retarded the development of such area.

Change in Water Taste

Cemeteries are among the chief anthropogenic sources of pollution and contamination of water in the urban areas and beyond. Some respondents (6.6%) are attested to the fact that the test of water around the cemetery environment is hard compared to the far area.

"A respondent at the neighborhood of Kumo cemetery confirmed the situation through practical comparison between two hand pump boreholes inside the cemetery and another borehole that is far away from the cemetery. After tasting, the difference in water taste was noticed".

The finding was supported by Rodrigues and Pucheco (2003); Dent (2004) in their separate studies found that in the process of decomposition of human body 0.4-0.6 liters of leachate with a density of 1.25 kg cm^3 is produced per 1kg of body weight. This liquid is characterized by high conductivity, pH, and biochemical oxygen demand (BOD) values and by its specific odor (Matos, 2001). The contaminants come

from the body and can include chemical substances applied in chemotherapy and embalming process e.g., arsenic, formaldehyde and methanol; make up materials such as cosmetic pigment, and chemical compound.

5.2. The Effects of Cemetery Landscapes on Vegetation

Effects of establishment of cemetery in a particular area on vegetation have been observed in the study. It has been discovered that all Muslim communities in the study area uses firewood stick and leaves of trees to cover a grave during burial rites. Thus, trees around the cemeteries are cut down for that purpose hence, the extinction of many species of trees in the study area. People mostly cut branches of trees in excess during burial, thereby making the regeneration almost impossible. In almost all the active cemeteries visited, few trees were observed and this is connected to the mode of burial practice in the study area. With the help of local guides, different species of plant in the cemetery's zones of Gombe State were identified with their local names are some plants species found in both active and inactive cemeteries in the study area. Majority of those plant species are found in inactive cemeteries because they are abandoned areas, the plants can be able to regenerate faster. The most dominant species in inactive and active cemeteries are *Piliostigma reticulatum Kargo* with a total of (1,265) stands, followed by *Azadirachta indica (257), Ziziphus abyssinica (Magarya) (230) Rhamanaceae Jatropha curcas L. (Binidazugu) (225), Cassia singueana Rúnfúú* the reason for their dominance is because they have high resistance to harsh environmental condition that characterized the savannah ecological zone.



Plate 1: Level of Vegetation Destruction within Cemetery
Source: Fieldwork, 2022

This vegetation has medicinal, economic and aesthetic value. For example, according to some respondents, the back of *Azadirachta indica,* the leaves and seeds are used to make medicine by many people in the study area. Less frequently, the root, flower and fruit are also useful. Some people in Nafada and Bajoga extract neem oil which is very effective in skin nourishment and applied it directly to their skin to treat head lice, skin diseases, wound and stomach ulcers.

The effect of empirical normalization on the NDVI images generated for this study was examined by comparison of derived NDVI images from the three different processing levels [i.e. derived NDVI from (a) uncorrected raw DN image data, (b) atmospherically corrected image, and (c) radiometrically

normalized image]. The essence is to examine the influence of atmospheric correction and radiometric normalization on the quality of NDVI data used in the subsequent analysis. Illustrates the summary of the descriptive statistic of NDVI resulting from the three different levels processing. From the generated statistics, it appears that after applying the atmospheric correction the minimum and maximum values were stretched between -1 and 1 which is the extreme values for NDVI. The implication of having 1 as the maximum value is that the vegetation is very dense and perhaps as dense as those found in irrigated agricultural plots or within the tropical rain forest zone as against the guinea savanna vegetation zone where Gombe State is situated. This indicates that though there was correction on the images but there still exist some residual mismatch on the scenes.

Simple Image Differencing (SID) is a pairwise comparison technique which tends to establish evidence of change between two dates (Eastman *et al*., 2007; Murtala, 2014). The results from differencing operation yield a continuum of different values that in which positive and negative values represent areas of change and zero values represent no change. The positive change signifies an increase in NDVI (vegetation regrowth), while the negative values indicate loss in NDVI (deforestation or vegetation degradation). The net change in NDVI values provides a measure of absolute change.

Table 3: Normalized Digital Vegetation Index Values

S/NO	VALUES	INTEPRETATION
1	-0.1 to -2	No Vegetation (treeless)
2	-0.3 to -0.4	Little Vegetation (e.g., single stand tress)
3	0.5 to 0.6	Sparse Vegetation (e.g., Sudan savanna)
4	0.7 to 0.8	Dense Vegetation (e.g., Guinea Savanna Forest)
5	0.9 to 1	Thick Vegetation (e.g., Rain Forest, Mangrove Forest)

Source: Adopted from Omuto, (2011).

Figure 2 showed the direction of changes in vegetation cover in the cemeteries between the period of 1999, 2009 & 2019. The direction of vegetation decreases in NDVI images showed that in 1999 all cemeteries in the study area displayed positive values ranges from 0.56 to 0.78. the vegetation covers as of then were in good condition and the reflectance value was quiet encouraging but later on after few year changes in vegetation status was stated to manifest.

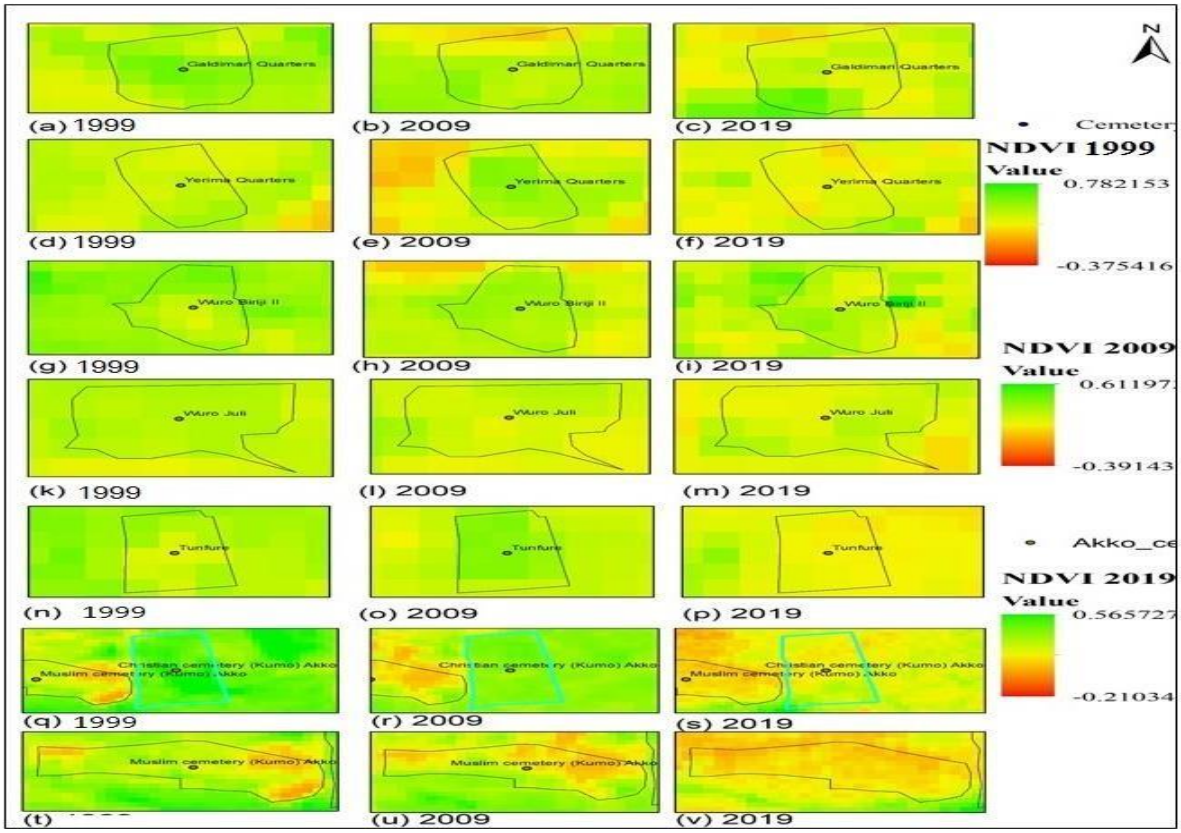


Figure 2: NDVI Images of Study Area
Source: Fieldwork, 2022

From 2009, the NDVI images started showing a mixture of both positive and negative values in some cemeteries like Kalshingi road cemetery (<0.5) and closer to (-0.2), Hurmin Da'u (<0.2) to -0.2, Bajoga cemetery (Patiskum road) with NDVI value of <0.1 to -0.2 among others. These results indicated a gradual change in vegetation due to human interference like logging, and cutting down of tree parts for burial Plate

In 2019, almost all the cemeteries were affected by vegetation destruction due to various factors like human influence as stated earlier. The NDVI value in 2019 shows a negative index in almost all the cemeteries' ranges from -0.1 to -0.3 depending on the location. For example, Bajoga cemetery (Patiskum Road), Deba central cemetery, Nasarawo I&II are the worse affected as shown by NDVI images of 2019 <0.2 to -0.2, <0.2 and closer to (-0.2) and -0.1 to -0.3 Figure 12, 13 and 18 respectively. Those cemeteries are severely encroached based on the R value and the NDVI images. These cemeteries where formerly vegetated looking at the images and R values of 1999, 0.56 to 0.78 and average, but due to the continued exploitation of trees around the cemeteries which is used for burial practice (grave covering) leading to the total extermination of trees around the cemetery's environment particularly the aforementioned ones.

6.0 CONCLUSION AND RECOMMENDATIONS

It can be concluded that people prefer to locate cemeteries at a distance location from settlement due to psychological trauma attached to the graves. Islam and Christianity attached sacred value to cemetery and burial ground which affect the economic value of land in the surrounding.

The use of vegetation for burial activities particularly covering graves threatens the survival of trees in the active cemeteries. These activities which have been taking place for quite a long time and have been on the increase due to increase of human population will result to severe damage of natural vegetation in the

study area with current dependence of people on natural vegetation (trees in particular) for burial activities and with the existing population growth rate and the correspondent death rate, this situation will worsen unless measures are taken to improve forest management and work both devise strategies for conserving natural vegetation and to find alternatives for covering graves.

Recommendations

I. There is the need for provision of adequate facilities and equipment in all the cemeteries since they serve as a place of abode to every decease person regardless of status or creed. The design of the cemeteries should be appealing with roads, drainages, parking space, water facilities among others. These suggestions need to be captured in annual budget by Gombe State government and make its one of it projects.

II. Burial at home reduce the value of the house when put on sale, therefore the study recommended the use of cemetery for burial. Therefore, individuals and religious organization should keep on enlightening the general public on the advantages of using cemetery space for burial or rather the government should ban burial at home.

III. It has been discovered that use of vegetation in covering grave have pose serious danger like deforestation and loss of biodiversity, therefore the study recommended the new method of burial practice by using mood pots as an alternative to firewood sticks and leaves for covering graves as it is being practiced in Kano and other towns and villages in some part of northern Nigeria.

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