

*Full Length Research Paper*

# Assessing conflict impacts on urban physical infrastructure: A GIS approach

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**This paper used geographic information systems (GIS) technique to assess the impact of conflict on land use in Ile-Ife and Modakeke in Nigeria. There has been limited systematic research work in terms of mapping the impacts of the communal crisis on the land use pattern using GIS. Therefore, the major aim of this paper is to map the impact of communal conflict on land use with the aid of GIS. Global positioning system (GPS) was used to take the co-ordinates of the affected area. The GIS map produced more than six years after the last clash between both communities. The research team counted 53 houses that were totally destroyed and remained to be re-built or rehabilitated.**

**Key words:** Conflict, land-use planning, assessment, GIS analysis.

## INTRODUCTION

There is no doubt that conflicts have become part and parcel of human organizations all over the world. This indeed, is a paradox because of the amount of energy and resources expended by communities in order to prevent and resolve conflicts. The term "crisis" in this research work is used loosely to include violence and clashes producing such violence. Ile-Ife and Modakeke (IM) are two neighbouring communities in Osun State of south-western Nigeria. Both communities are so close together that one may find it very hard to delimit a clear-cut boundary between them. A visitor to the area would hardly know when he has left one community for the other as both communities have, through long historical interaction, including inter-marriages and extensive business and development partnerships, evolved into a single large conurbation.

The two communities belong to the Yoruba nation. Despite this closeness, both communities have a long and surprising history of mutual hostility that often spills over into sporadic crises and violence. Conflict in IM is a struggle over values, claim to status, power and scarce

resources in which the aims of the opposing parties are not only to gain the desired values but also to counteract injure or eliminate rivals. Mutual antipathy between the two neighboring communities is not entirely unusual. Intractable conflicts, like IM conflicts, are ones that remain unresolved for long periods of time and then become stuck at a high level of intensity and destructiveness. For instance, communal violence between the two communities occurred for many years: 1962; 1980s; 1997 to 2000. The effects of the resent conflict in the communities are very enormous, even the dilemma of these is still apparent up to today. Several other studies have considered conflict in Nigeria as well as other countries (Thamhain and Wilemon, 1974; Fabumi, 1985; Zikmann, 1992; Beverly and Ronnie, 1995; Olufokunbi, et al. 1997; Randy, 1997; Frances, 2001; Tanya, 2002; Dunmoye, 2003; Institute for Peace and Conflict Resolution, (IPCR), 2003 and Imobighe, 2003). IPCR (2003) observed that thousands of people died as local communities continued to compete for scarce resources in Niger Delta and other part of Nigeria.

The studies reported that criminals and hired mercenaries from other areas of Nigeria, Benin Republic, Chad, and Niger added to the violence after being hired and induced by some communities to attack rival villages in the state. Olufokunbi et al. (1997) observed that conflict over land rights and ownership continued among members of the Tiv, Kwalla, Jukun, and Azara ethnic groups; each of these groups resided at or near the

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convergence of Nassarawa, Benue, and Taraba States. The Tiv, who were thought to have migrated to the country later than other inhabitants of the disputed area, were regarded as interlopers by the "indigenous" ethnic groups despite the fact that they predominate in much of Benue and parts of other states (Imobighe, 2003). Ethnic crisis, particularly in Delta, Rivers, Bayelsa, and Akwa Ibom States, have led to environmental degradation and government indifference to their status in the Delta despite the fact that most of oil wealth comes from the Niger Delta region. Groups such as the Ijaw, Itsekiri, Urhobo, Isoko, and Ogoni continued to express their unhappiness about their perceived economic exploitation and the environmental destruction of their homelands, and incidents of ethnic conflict and confrontation with government forces continued in the Delta area. Surprisingly, there has been limited systematic research work in terms of mapping the impacts of the communal crisis on the land use pattern, life and other human resources using geographic information systems (GIS). It is known that GIS deals with information relating to spatial distribution of features on the earth's surface, and is designed to efficiently capture, store, update, manipulate, analyze and display all forms of geographically referenced information such as conflict impact on land use (Malczewski, 1999). Thus, nowadays, GIS is used widely as an effective tool for land use evaluation throughout the world. GIS is a novel technology widely used to survey the land use problem because it adopts the numerical methods and spatial analysis tools to delineate the land use.

In contrast to the manual methods, the GIS is the most economic and objective method (ESRI, 1991). This validates this research work since governments, policy makers and NGOs need these types of detail GIS maps to observe the negative impact of conflict on land use and to plan conflict management scheme. Such maps will help them to know the location to assist people who were really affected by the crisis and locate where the land use planning has been shattered. It is at this surveillance that this study mainly aims at mapping the impacts of Ife and Modakeke (IM) communal conflict on land use with the aid of GIS.

The objectives of this study include the following: (1) To identify and map the affected area during the communal crisis between IM communities; (2) To create GIS database of IM area and (3) To suggest lasting solution to conflict in the area.

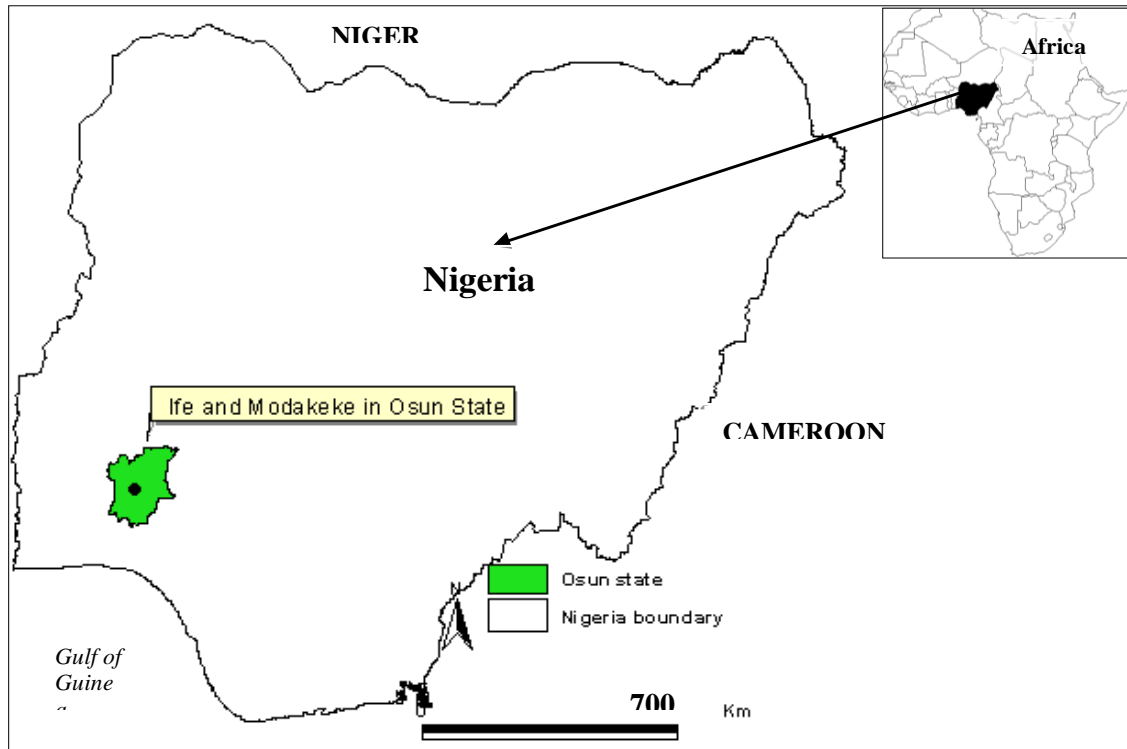
### **About Ife and Modakeke, Nigeria**

The study was carried out in Ile-Ife and Modakeke communities of Osun state in south-western Nigeria. They are located approximately on latitude 7°29'N - 7°30'N and longitude 4°32'E - 4°34'E (Figure 1), with total land area of about 22.96 square kilometers. Ife/Modakeke location, to some major neighbouring cities, is as follows: 86 km

east of Ibadan; 32 km southwest of Ilesa and 58 km north of Ondo (Ojo, 1978). They are situated on an elevation of about 275 m above the sea level (Ige, 1980). They are fairly plain, yet researchers still recognize small hills like "Okemogun", "Okesode", "Oke Arubidi", "Ileri" and others (The prefix "Oke" means "hill"). Both communities enjoy two characteristics quite unique to it.

The first is its historical role as the cradle of Yoruba culture and birthplace of the legendary Oduduwa, father of the Yorubas. The second point of special interest is the establishment, in the vicinity, of one of the largest (in ground area) University in African continent- Obafemi Awolowo University (Former University of Ife). The history of Ile-Ife is as old as creation itself. The reason being that various historians and archaeologists traced the origin of mankind to Ile-Ife. Ile-Ife, the cradle of Yoruba race, occupies a pride place in Yoruba history; as such its traditional ruler, the Ooni of Ife, is seen as the Arole (custodian) of Oduduwa, the progenitor of Yoruba. No one can say about the origin and the year it was created. The age and the origin of the city shrouded in mystery that has not been solved. Even that legend Oduduwa met Ife Aborigines when he arrived at the ancient city (Ige, 1980). Ife is the source of all that is Yoruba and the Ooni, the father of all Yoruba people which today spreads over eight contiguous states of the Federation of Nigeria; be they Modakekes, Ifes, Ibadans, Ekitis, Ketus and so on. The stool of the paramount ruler of the Ifes, the Ooni, also doubles as the spiritual head of the Yoruba race (Olufokunbi et al., 1997). Historical accounts have it that Ifes and Modakekes are sons and daughters of the same parents (Olufokunbi et al., 1997). As Yorubas, their ancestry is traced to Oduduwa, the progenitor of Yoruba race. It was the collapse of Old Oyo Empire in the 19th century (Fabunmi, 1985) which caused a flood of refugees down south, leading one of the displaced Oyo group of people to settle down in the area known today as Modakeke.

The Modakeke community is populated by individuals who migrated from the Old Oyo Empire in pre-colonial Nigeria and who, by all accounts, were well received, welcomed and settled down in Ile-Ife which is, according to legend, the cradle of the Yoruba nation. The founding of the Modakeke community was complete by the mid 19th century, as the founders of the community were Oyo migrants who were fleeing the invasion of Fulani Jihadists (from Northern Nigeria) in 19<sup>th</sup> century during the reign of Ooni Adegunle Abewela who granted them settlement in the land now occupied by the Modakeke community. Not only did Ooni Abewela receive the Modakeke, he also conferred the title of Ogunsuwa (or Ogunsuwa) on their leader, according to Olufokunbi et al. (1997), a notable scholar of Yoruba history: The Ife welcomed Oyo migrants as a source of cheap labour; but soon Ibadan began to use the Oyo settlers to intervene in Ife Politics. In 1851, the Ooni, in trouble with his Chiefs, and relying on the Oyo settlers for support, granted their request for a



**Figure 1.** Nigeria: Location of Ile-Ife and Modakeke.

township of their own outside Ife. The new settlement, named Modakeke, was later used by the Ibadan twice to sack Ife. The second time was in 1882 when the Alerin, the Ooni-elect, had to take refuge in Oke-Igbo. More specifically, there had been some enmity between the Ifes and their closest neighbours - the Modakekes. This enmity relates to the perceived marginalization of the Modakekes by the Ifes on one hand and alleged insubordination by the Modakekes towards their landlords, the Ifes, on the other.

## **MATERIALS AND METHODS**

The fieldwork commenced with office pre-field preparation through the use of Ife/Modakeke map. The base map which covered the section of Ife and Modakeke, on scale 1:2500 of 1995, were obtained from Regional Center for Aerospace Study (RECTAS) and properly studied in order to be familiar with the study area. Accurate investigation in terms of observation was carried out on the field through "In-Situ" technique. A reconnaissance survey of the study area was carried out which will aid data collection from the field. The primary ideal way of obtaining this spatial data is by direct observation of the affected land use categories in the study area (Figures 1 and 2). According to Geogiaeu et al. (2000), this technique is known as "In-Situ" spatial data acquisition method. This method of data acquisition is preferred in this study because reliable and precise data can be collected and interpreted immediately by the researcher. First hand data can be collected through this means of data acquisition. Both spatial (geometric) and non-spatial (attribute) data were used for this study. Spatial data were obtained by using both direct (field survey or primary

data) and indirect (archival or secondary data) spatial data acquisition technique. Direct spatial data acquisition that was used for this study is field survey technique. Indirect spatial data acquisition technique that was used in this study was by scanning and digitizing the existing maps of Ile-Ife. This gave opportunity of obtaining digital version of the original (analog) map of the study area. Actually, this will be the first process that will be taken in e-mapping that is the backbone of this research work. Other sources of archival data include journals, articles and other literatures from Hezekiah Oluwasanmi Library of Obafemi Awolowo University, Ile-Ife, Osun State. Attribute data that were used include the name of the street, compound name among others and these formed part of GIS metadata, which is very important in GIS database creation and design.

The data collected from the field were used to update the existing analog maps of the study area that was produced in 1972. The spatial-analytic capability distinguishes GIS from other data processing systems. The objective of spatial data analysis to this study is to transform data collected from field into useful information. There are several analytic functions in GIS, but measurement, spatial query, classifications and over-laying technique were used for spatial data analysis in this research work. Computation of trend and rate of land use changes due to crisis was done and percentage change was computed.

Thorough measurement, classification, query, trend and percentage change in the whole of study area were grouped into dangerous zone, risky zone and safe zone. Land use features that were destroyed during the crisis were investigated along Mayfair, Seventh Day Adventist, Lagere and other areas where the conflict impact is tensed. Thorough investigations were carried out in Akarabata Layout- Lines 1, 2 and 3 where the crisis was extensive. All the buildings; residential, commercial and public that were shattered during the crisis were noted and global positioning systems (GPS) were used to take the co-ordinates of the affected

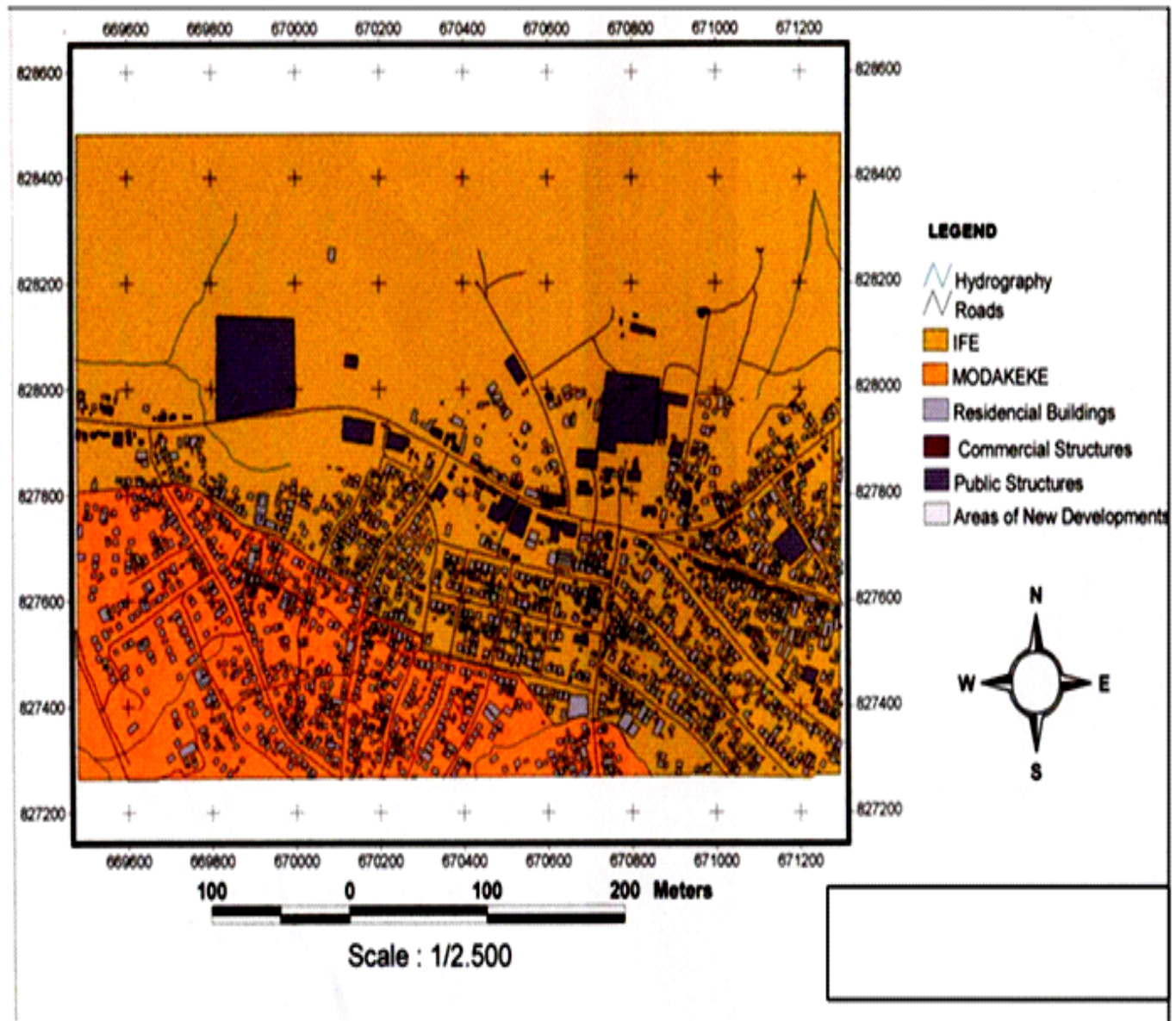


Figure 2. Ile-Ife and Modakeke: before the conflict.

area. In order to carry out a structural and precise study, an extensive GPS network comprising of 30 stations, was set up so as to examine the crisis zone in details. The distribution of the GPS stations are as follows: 10 GPS stations on each layout (Akarabata Layout- Lines 1, 2 and 3) making the total of 30 stations; 4 stations on each layout side (4 sides each), one station on the central of each layout. The observations at the selected points were taken using field notebook and dual-frequency geodetic GPS receivers. GPS was also used in order to effectively recognize co-ordinates on the field. This was later enhancing quick and accurate georeferencing of the maps to be produced. Although remote sensing imagery is one of the ways of obtaining "In-Situ" spatial data, but due to the resolution problem of the remotely sensed imageries and its constituent pixel with raster format which was not given detailed information about the affected land use during the crisis, image will not be totally depended upon as means of data acquisition for this study.

#### From existing analog map to digital map

Generally, a digital 48-bit colour scanner was used to scan the map. The scanned map was improved with various techniques of image processing. These include the correction of colour brightness and contrast, the smoothing of lines, among others.

The digitization of spatial features was done starting from points, lines and areas features (roads, rivers, and house among others). Each feature was digitized separately on a single layer using the integrated land and water information systems (ILWS) together with Arc-View GIS Version 3.2, product of Environmental System Research Institute (ESRI). Each layer was given a different colour to depict the conventional presentation of a GIS map (Kufoniyi, 1995).

The following layers among others were created: residential, commercial and public buildings, road network, rivers, buffer zone-dangerous zone, risky zone and safe zone.

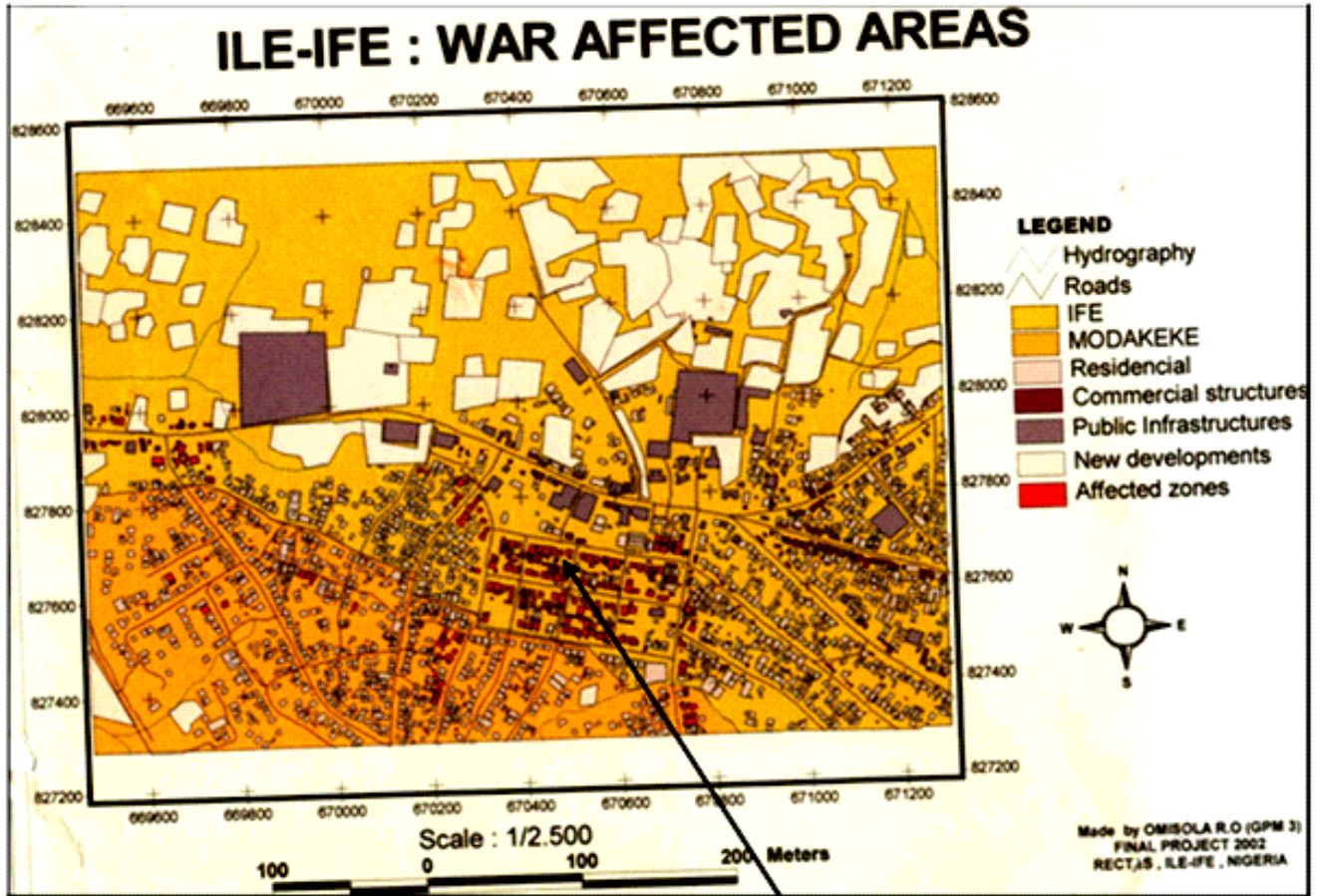


Figure 3. Ile-Ife and Modakeke: war affected areas.

## RESULTS AND DISCUSSION

The crisis between the Ife and Modakeke communities has recorded over 2,000 deaths and several more injuries in the past two decades. Although not without a history, this crisis and the attendant violence seems to have acquired greater intensity in recent times in terms of the quantity and quality of human rights violations associated with it. In addition to violations of life and physical security, the Ife/Modakeke crisis has made thousands of people internally displaced. During the research trip in February 2006, more than six years after the last active clash between both communities, the research team counted 53 houses on both sides that were totally destroyed and remained to be re-built or rehabilitated.

According to Ehile Mannaseh, on 4 March 2000, my (law) chambers were burnt down (Figure 3). All properties, including law books were burnt when they

razed down the Mayfair Shopping Complex around 7.00 a.m."79 of the destroyed houses had been or were being rebuilt, while many others still remained as relics of the poor relations between both communities. Many other places of abode in surrounding villages were also destroyed thereby compounding the problem of internal displacement. Villages and farm settlements such as Abiri, Aromoko, Atakumosu, Deede, Ogudu, Ogundale, and Toro were reportedly looted and overwhelmed by the combatants. Mr. Opatola, a survivor, testified that the combatants". They also went to the villages and hamlets and forcefully took over farms, they burnt houses." Initially in 2000, the Obafemi Awolowo University, Ile-Ife, served as a temporary refugee camp for over 10,000 persons displaced as a result of the communal clashes prior to their moving to other neighbouring towns such as Akure, Ibadan, Ilesha, Lagos, and Ondo."

Neither side admits responsibility for the violations committed, but both sides assert provocation by the other

while claiming victim status. Since this last outbreak, a large police presence has been maintained in both communities, especially in Ile - Ife. The palace of the Ogunsua of Modakeke is still being guarded by a phalanx of well-armed mobile policeman. Apart from the high sense of insecurity and tension evident in both communities, there is also a lingering bitterness occasioned by the perception that successive governments have condoned, taken sides in or, at least, failed to ensure accountability for the violations committed by different sides in the Ife-Modakeke crisis. Some interviewees like a Modakeke youth leader, vowed to pass on their "experience to generations unborn."

### Gender-specific violations

The killings in the Ife/Modakeke crisis have increasingly acquired an indiscriminate edge. It is estimated that up to 30% of the people killed, injured or assaulted in the crisis have been women. Members of both communities acknowledge that there have been so many inter-marriages between both communities over the years that it is quite difficult and, perhaps, impossible to discover a family on either side that can successfully claim purity of Ife or Modakeke bloodlines. It was discovered that during the 1997 and 2000 crises, women who had inter-married were particularly targeted and victimized. In the most recent clashes, there were many credibly attested reports of killing of women for ritual purposes. Rape and sexual assault was freely employed as a means of expressing intercommunal differences. Women who had inter-married across community lines were a focus of the sexual violence.

### Violations against children and the aged

Children and the aged have not been spared. The study discovered that about 5000 children and old people have been killed and victimized during the crises. The wanton destruction of schools has led to the habitual disruption of the academic and educational programmes of children in the affected communities. About 35 classrooms are still not rehabilitated in Seven-day Primary and Secondary school along Mailfare-Lagere.

### Conclusion and Recommendations

The impact of Ife/Modakeke communal crisis on land use and life has been discussed in this study with the aids using geographical Information systems (GIS). The essential aspects that should be considered for this research works were addressed. Many studies have been concerned with conflict management but this research work involves a systematic mapping of the conflict impact on land use, which is the latest way of mapping

using GIS. To achieve the aim of this study, GIS methodology was carried out and it expected that maps produced will be useful to both government and stakeholders who are involve in conflict eradication or management. In enhancing the roles and relevance of the on-going (as well as future) democratic experiment in resolving the identity and ethnic questions in Nigeria, the following are recommended:

1. Democratic governance and processes in Nigeria should accommodate continuous expressions of autonomous popular decision-making that come about through constant struggle. They should also involve the institutionalization of rules and procedures that allow freedom of expression and the diversity of opinions.
2. Expansion of the democratic space through the introduction of non- militarist as well as friendly economic policies. These would resolve the militarism, repression, harsh economic policies and the greed of the ruling class in grabbing state resources for themselves and which have created and/or intensified communal and religious clashes over the years.
3. National efforts should be made to advocate the collective nurturing of democracy through civility, moderation, tolerance and the spirit of accommodating other people's views.
4. Minorities and other oppressed groups should strive and promote their specific interests through practical involvement in national and grassroots organizations within the limits of democratic principles.
5. Governments at all levels must ensure the demoralization of the national economy to accommodate all categories of religious, cultural, ethnic and/or linguistic groups or constituencies.

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