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Program of Geography, Centre for Development, Social and Environment,
Faculty of Social Sciences and Humanities,
Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia.
Email: aznie@ukm.edu.my

Abstract
Internal forced migration is an involuntary movement of people internally within an administrative boundary of a country also referred to as internal displacement it transpires as a result of internal conflict, physical or environmental disaster and famine and developmental projects. The Northeastern part of Nigeria has been faced with series of humanitarian crises that has forced over 2.3 million people out of their habitual residential areas into a new geographical location. The aim of this paper is to understand the spatial and temporal pattern of internal forced migration in Northeastern parts of Nigeria using the two key variables of space and time. Secondary data for December 2014 – August 2017 as obtained from the United Nations International Organization for Migration (IOM Nigeria) were used and analyzed for the study. The findings of the study reveal that forced internal migration is unevenly distributed over the periods under investigation in the study area and some areas within the study area attracts large number of migrants because of insecurity, insurgency, and terrorist activities in the area. The study also shows the distribution pattern, number and magnitude of the migrants using the space and time variables in a GIS environment.
Keywords: *Displacement, Internal Forced Migration, Migration, Spatial, Temporal*.

Introduction
Migration is the movement of people from a particular geographical location to another, this can be between a given distance, scale, magnitude, reason or purpose. Migratory movements are broadly classified into being either internal (within an administrative boundary of a province, region, state or country) or international that is between countries and voluntarily or involuntarily (forced). Indeed, compared to international migration that has received much a greater amount of consideration and accepted by many scholars in the fields of geography, economics, sociology, developmental studies, anthropology and history, however, internal migration is still receiving less consideration (Rees et al.

2016; Mukhtar et al. 2017; Hamzah et al. 2016; Hajinoor 2001; Eweka & Olusegun 2012). Although, its extents and rate are generally higher as (Odunmorayo 2015) highlights that the rate of internal migration in United State is twice the rate of the country's international migration flow.

Nigeria has record quite a large number of internal forced migratory movements from 1960 when the country got independence to date, caused mostly by conflicts and insurgent activities. The major conflicts and crises that caused the internal migratory movement are the Nigerian civil war also called Biafra war between 1967-1970, the Mai-Tatsine crisis in Northern Nigeria between 1979-1980, the 2011 post-election crises, the Boko Haram insurgent activities (2009 to date), and series of Fulani herdsmen crises, likewise the country has also records several physical environmental disasters, developmental projects and famine (IDMC 2015). IDMC (2017), offered that in recent years the increasing number of internal forced migrants in Nigeria is becoming disturbing and terrifying. As people are being forced to leaves their homes because of conflicts, persecution based on religious, social and political group and crises. The Internal Displacement Monitoring Centre (Shettima 2015) reported that Nigeria alone accounts for 8.88% of the total number of internal forced migrants around the world.

The IDMC (n.d) reported that the highest total number of internally displaced persons in Nigeria as a whole was recorded in December 2015 and the number was 2,152,000 (Adeyemi 2014). The National Emergency Management Agency (NEMA) however, disclosed that over 80% of the total number of internal forced migration in the country are caused by the activities of the Boko Haram and this huge percentage dwell in the Northeast region of the country Abdulrasheed et al. 2015).

The Northeast region of Nigeria has been well known for its peace, hospitality and harmony, however in recent years the region has been facing staid terrorism and security challenges caused by the Boko Haram insurgent group (Aliyu et al. 2015; Shamaki et al. 2017; Vivien & Shamaki 2017; Aliyu et al. 2016). This is adduced to their wrong indoctrination and belief (Adamu 2009). The group started lunching attacks in 2009 in Maiduguri the capital of Borno state and has resulted in the loss of properties worth millions of dollars and the loss of many lives (Adamu 2009; Yerima & Singh 2017).

The Boko Haram Insurgent group is believed to be the major cause of internal forced migration in the study area (Mantzikos 2010) allege that the group was founded in 2001 in Borno state, however, Adamu (2009) and NBS (2017) contended that the group originate in 2002 with headquarters in Maiduguri the Borno state capital. Thereafter in 2010 Mantzikos (2010) established that the group has international link with Al-Qaeda terrorist group. In this study a spatio-temporal technique that is a statistical method of describing and explaining the spatial and temporal variable exhibited by a given phenomenon was utilize, this takes into consideration the geographical location (space) and time when the internal forced migration takes place. The objective is to develop understanding of the spatial and temporal pattern of internal forced migration in the study area.

Study area
The northeastern Nigeria is one of the six geopolitical zones in the country comprising of the following six states: Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe states. It is located between longitude 09°02' – 14°38' East and Latitude 06°30' – 13°42' North. The northeastern part of Nigeria share boarder with the following three international countries: Niger Republic in the North, Republic of Chad in the North East and Republic of Cameroun in the East, a map of the study area is presented in

Figure 1. The zone covers slightly about 280,419km^2 that is approximately one-third of the total 923,768km^2 of Nigeria's total land area. According to the 2010 National Bureau of statistics projected population, the region has approximate 23.5 million inhabitants that is about 13% of the country's total population.
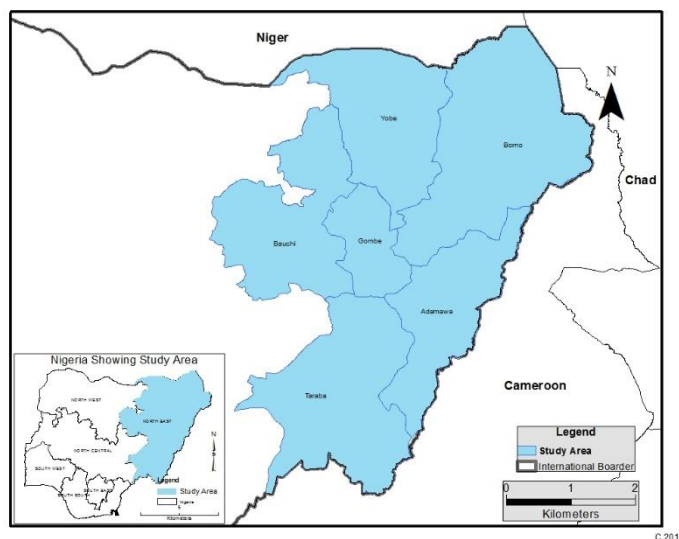

Fig. 1: Study Area

In terms of economic activities, the zone is the major national contributor to net food production, however, it is still the worst in terms of socioeconomic conditions and has the highest poverty rate in the country with an average poverty rate of 69% which is more than the 60% country's national average (NBS 2017).

Methodology
The methodology adopted for this study is the quantitative research methodology. According to Fellows and Liu (2008) quantitative research methods are "typically adopted because they are scientific methods and provide immediate results". The source of data utilized for this study is mainly the secondary data source obtained from the International Organization for Migration – Nigeria (IOM Nigeria), the data for 16 periods December, 2014 to August 2017 were collect from the Displacement Tracking Matrix (DTM) records, which were then sorted and entered into Microsoft excel for further analysis (IOM 2017).

The data stored in Microsoft excel file was converted into Comma Separated Value (.csv) file which is readable by the ArcGIS software packages and then added into the ArcGIS version 10.4 for the spatial and temporal analysis of the data. The time series analysis of the data was also plotted on a graph using Microsoft Excel.

Results and Discussions
Spatial distribution of internal forced migration Dec. 2016-Aug. 2017
Figure 2 shows the spatial distribution of internal forced migrants from December 2016-August 2017. The results for the spatial distribution from December 2016 to August 2017 also shows that Borno state has the highest number of internally displaced persons in the study area and the state accounts for more than 75% of the total number of internal forced migrants in all the four periods under investigation. In December 2016 it was reported that out of the total number of 1,770,444 internal forced migrants in the study 77.43% were reported to be living in Borno. February 2017 was reported to have a total of 1,899,830 internally displaced persons with 79% of the total reported to be in Borno. Similarly, in May 2017 and August 2017 the total number recorded were 1,884,131 and 1,1757,288 whilst the percentage Borno state represent were 79.45% and 78.16% respectively. Conversely, Gombe, Bauchi and Taraba states continue to have the lowest number of forced internal migrants with each individually having less than 4% of the total number in the study area. Comparably, the distribution in Adamawa and Yobe for the period December 2016-August 2017 is relatively evenly distributed as Adamawa state is reported in all the four periods to have a higher percentage than Yobe.
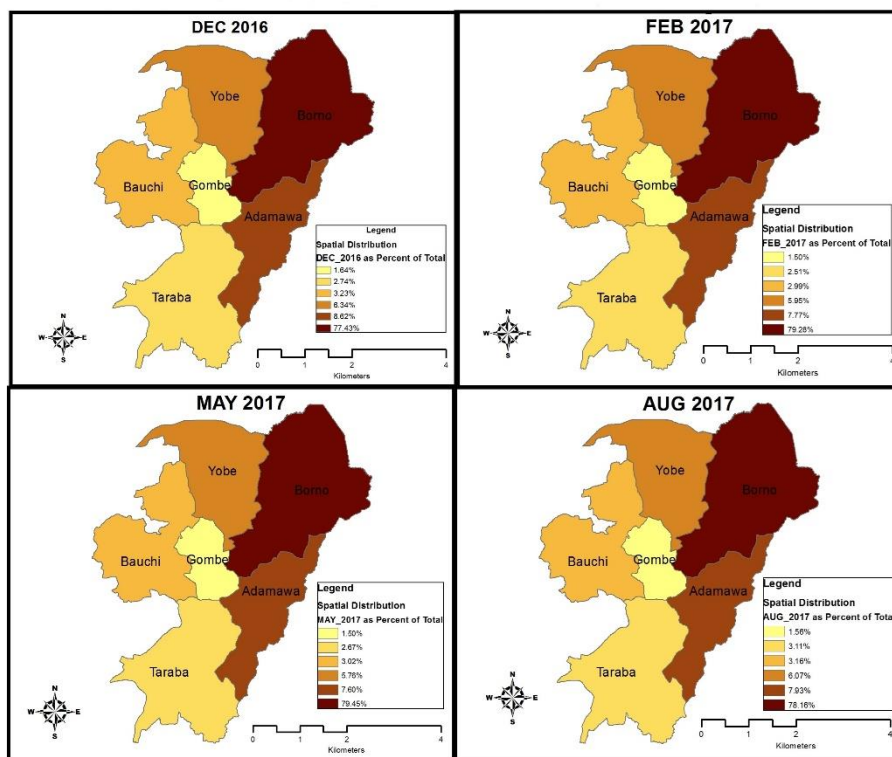

Fig. 2. Spatial Distribution of Internal Forced Migration Dec 2016-Aug 2017

Temporal trend of internal forced migration Dec. 2014-Aug. 2017

A time series analysis was carried out on the discrete time data collected for study, the result of the analysis as shown in Figure 3 depicts the overall trend of internal displacement in the study area over the period under study. From the figure it can be descried that Borno state has the highest number of internal displaced persons throughout the period under study, then followed by Adamawa, Yobe, Bauchi, Taraba and Gombe respectively.
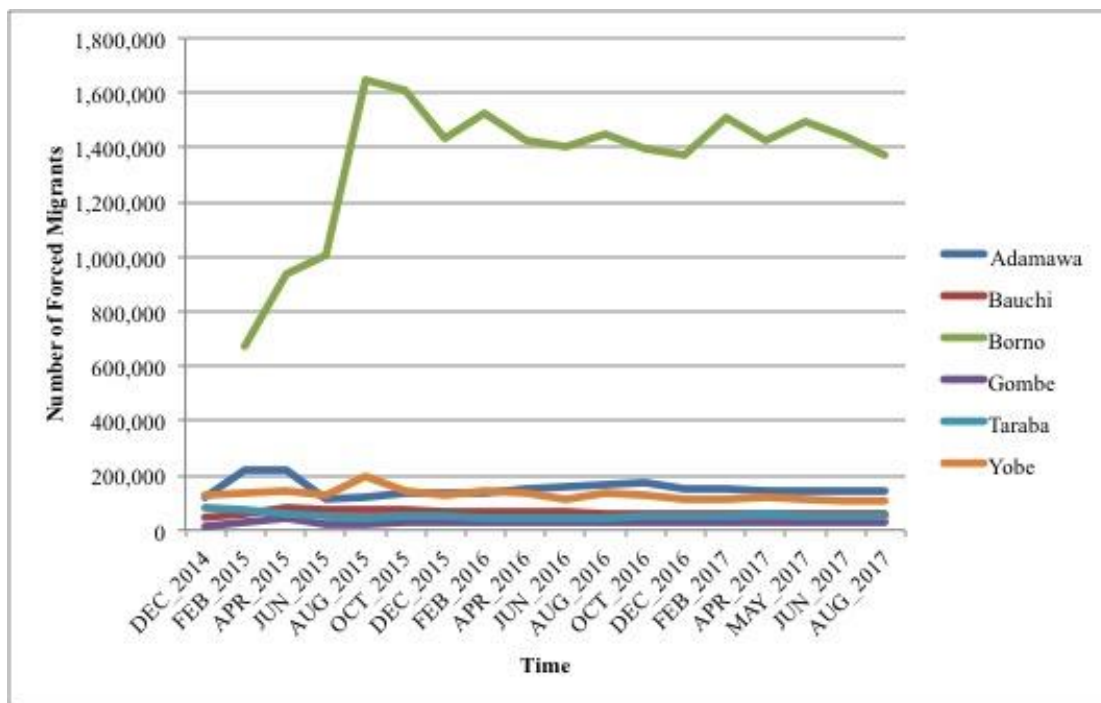

Fig. 3. Temporal Trend of Internal Forced Migration Dec 2014 – Aug 2017

Spatio-temporal distribution Dec 2014-Aug 2017

Based on the results of the spatial distribution and temporal pattern of internal forced migration in the study area, an overall map of the spatio-temporal pattern was presented in Figure 4. The map displays how the distribution and magnitude of internal forced migration varies between the six states in the study area, showing how uneven the distribution is across the periods December 2014-August 2017.
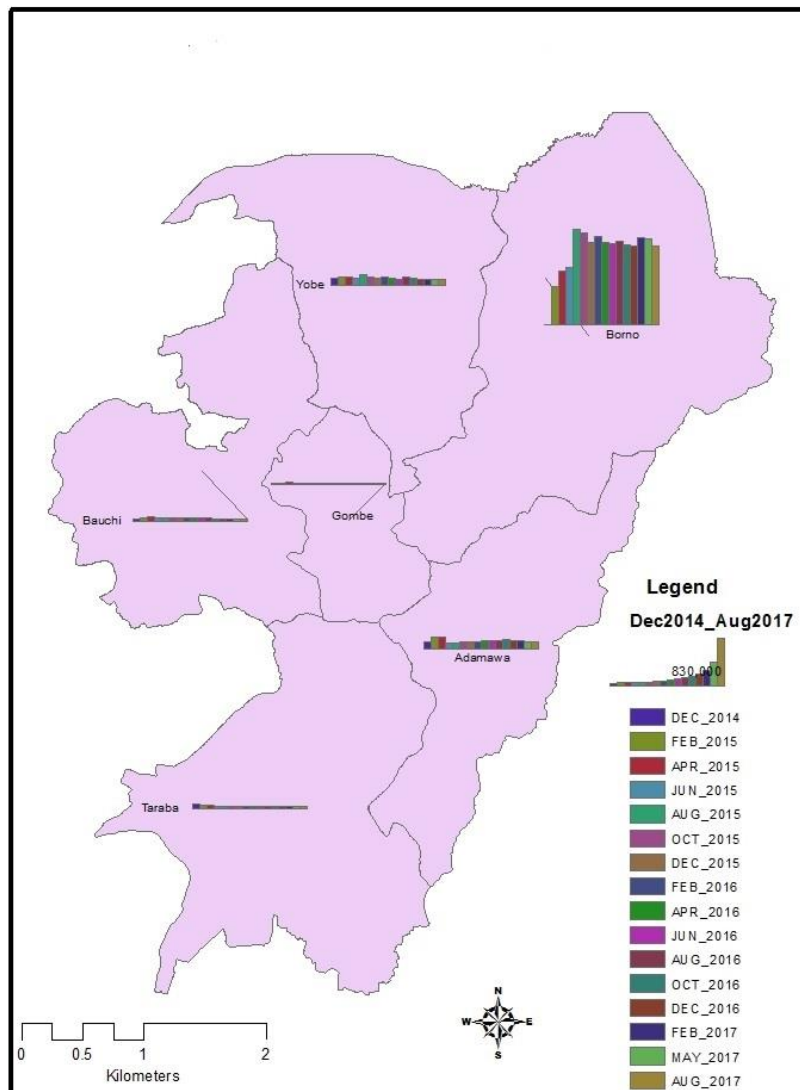
Fig. 4. Spatio-Temporal Distribution Dec 2014-Aug 2017

Discussion and Conclusions

The GIS technique of mapping initiate the connection and allow the linkage of spatial and temporal data in other to study the extent, trend and pattern of distribution of a phenomenon on any particular point on the earth surface. It also allows for an informed statistical analysis of the data under investigation. Mapping has proven to have a strong impact in terms of visualization and analysis; this study used the power of mapping to provide a meaningful visualization depicting the spatial and temporal distribution of internal forced migration in Northeastern Nigeria.

Based on the results of the study and the outcome of the research it is seen that the number of Internal forced migrants in the study area is unevenly distributed as some area are having a relatively high number of migrants than others. For instance, results from the study has revealed that in all the periods under study with the exception of December 2015 when the data for Borno state was not readily available, the state recorded the highest number of internal forced migrants accounting for more than 50% in all the study periods, this may be attributed to the fact that the state is the birth place of the insurgent terrorist group Boko Haram and is the worst affected, the state also records the highest number of insurgent activities, these thereby enforce its inhabitant to flee to areas that are safer than their habitual places of residential origin, National Human Right Commission.

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Corresponding Author
Rosniza Aznie Che Rose is a Senior Lecturer at Program of Geography, Centre for Development, Social and Environment, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia. E-mail: aznie@ukm.edu.my

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