Spatial Distribution of Hotels in Ile-Ife and its Environs, Osun State, Nigeria

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Abstract: This research was carried out to identify, locate and to examine the factors that influenced the pattern of distribution of hotel in Ile-Ife and its environs in Osun state Nigeria. The geographic coordinates of the location of the hotels were collected with a GPS device receiver and their corresponding attributes to build a data base. Using the various technicalities of Geographic Information System (GIS), the spatial statistical analysis was carried out to determine the spatial distribution pattern of the hotels in Ile-Ife and its environ. The average nearest neighborhood analysis was carried out to determine the distribution pattern of the hotels. The result of the spatial pattern of distribution carried out using the Manhattan method of Nearest Neighbor analysis shows a clustered pattern of distribution with NNR of 0.600161 and Z-score of -5.244029.

Keyword: *Accommodation houses, Average Nearest Neighbourhood, Geographic Information System, Spatial Statistics, and Spatial Pattern.*

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I. INTRODUCTION

Accommodation houses, including hotels, motels, hostels, guest houses, bed and breakfasts, and other commercial enterprises (hereafter referred to by the generic descriptor—hotels) represent temporary homes away from home for tourists, and as such, are the focal point from which most tourism activity emanates in a destination [1]. Tourists start their day's businesses by leaving the hotels, somehow return during the day to take a recess and finally go back to rest for the day. So many researchers have carefully looked into the essence of the location of hotels. Some of these researchers amongst several others are [2][3] [4].

Spatial location is one of the most important factors for a new hotel establishment. Compared with enterprises in manufacturing industry, their counterparts in service industries, such as hotels, rely heavily on an effective location strategy to succeed in the competition to attract hotel guests to rent their rooms. An appropriate location is of paramount importance as it will be difficult and extremely costly for hotels to relocate and reconfigure their product offerings [5].

Geographic Information System (GIS) is a veritable tool to identifying and locating hotels and their facilities in the hospitality industry. With it, spatial distributional pattern can be identified, other service facilities around, accessibility level from point of origin to destination can be assessed. More so, cost of travelling and shortest route travel from origin to destination is efficiently and effectively handled. According to [6], GIS operates on two data elements, which are spatial and attribute data. Spatial data or geographic data refers to a known location on the earth surface which is defined by coordinates and the attribute by place names, address and post codes. Going by the versatility and the robust nature of GIS in achieving various tasks in so many fields of endeavors, hence the use of it in this research to achieve its aim and objectives.

This research therefore aims at to determine the spatial distribution of hotels and their accessibility to the tertiary institutions. The objectives are; (i) identify, locate and prepare attribute table for the hotels (ii) identify spatial distribution pattern of the hotels and (iii) to determine level of accessibility of the hotels to tertiary institutions in Ile-Ife and its environs.

II. STUDY AREA

The study covered Ile-Ife and its environs made up of four Local Government Areas (LGA). They are; Ife Central, Ife East, Ife North and Ife South. Two of these, Ife Central

and Ife East, are located within Ile-Ife Township. Ile-Ife is the foremost ancient Yoruba settlement and is in the present Osun state in the South-Western part of Nigeria. It is located on latitudes 7°28′N and 7°45′N of the Equator and longitudes 4°30′E and 4°34′E of the Greenwich Meridian. However, this research shall be limited to three local government areas which are Ife central, Ife East and Ife north. The map of the study area is as shown in figure 1.
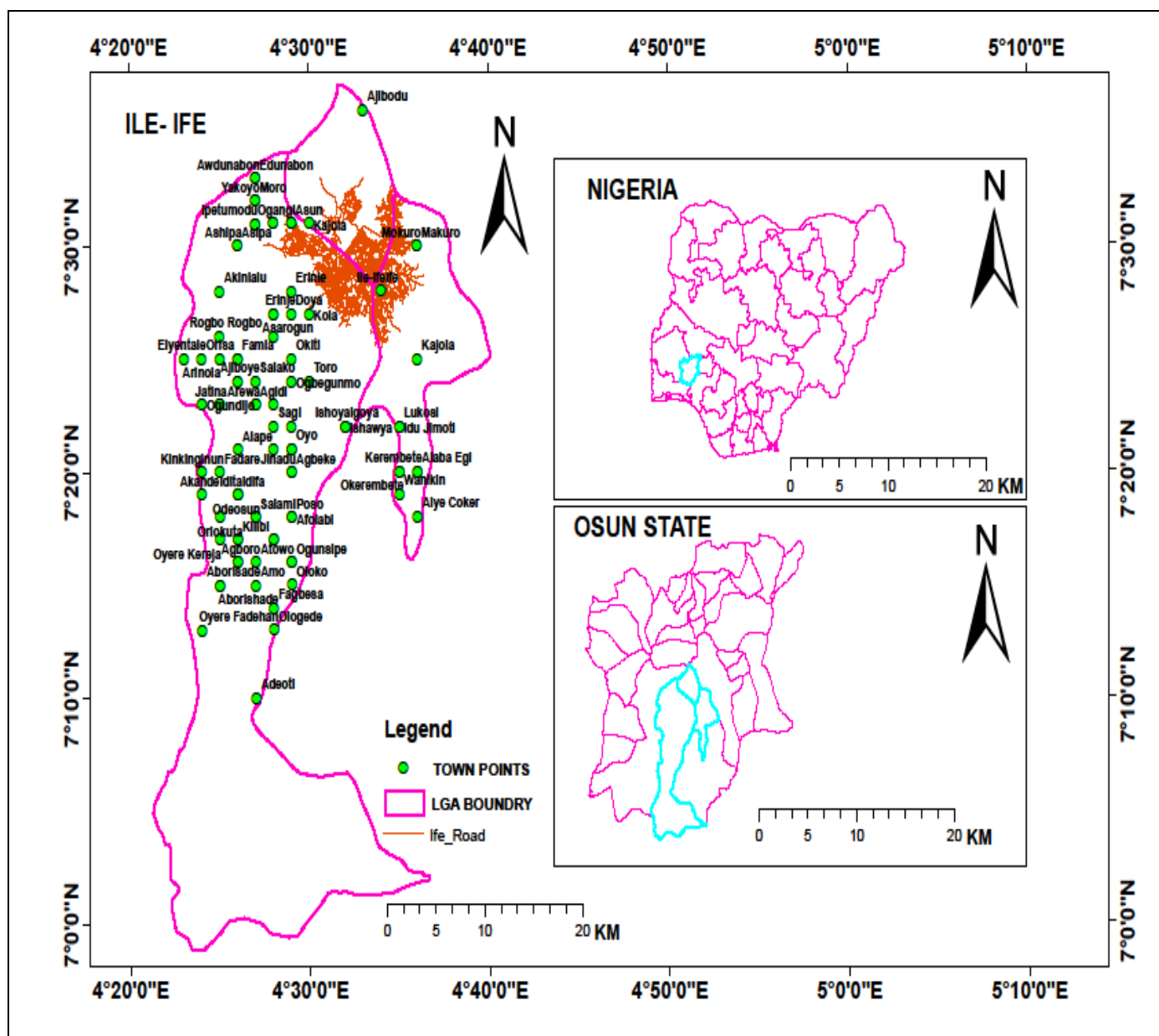

Fig 1: Map Of The Study Area

III. MATERIALS AND METHODOLOGY

The data used for this research are both primary and secondary data. The primary data was the use of the hand held GPS device in the field to take the coordinates points of the hotels. The secondary data are the administrative map and topographic map of Ile-Ife, were the roads, local government boundaries and settlements were generated. The list of the hotels and their respective addresses were obtained online from [7] edited and others were gotten while on the field by the authors. The topographic map was scanned and georeferenced to WGS 1984 and UTM Zone 31˚N. Personal geo database, features data set and feature classes for the roads and settlements were created. The roads and settlements were onscreen digitized using the georeferenced map and saved in the data base as line and point features respectively. The list of the hotels, addresses and their respective coordinate points were typed in excel spread sheet and incorporated into the ArcGIS 10.1 environment for various analysis that was carried out. The technical flow methodology of the research is as shown below.
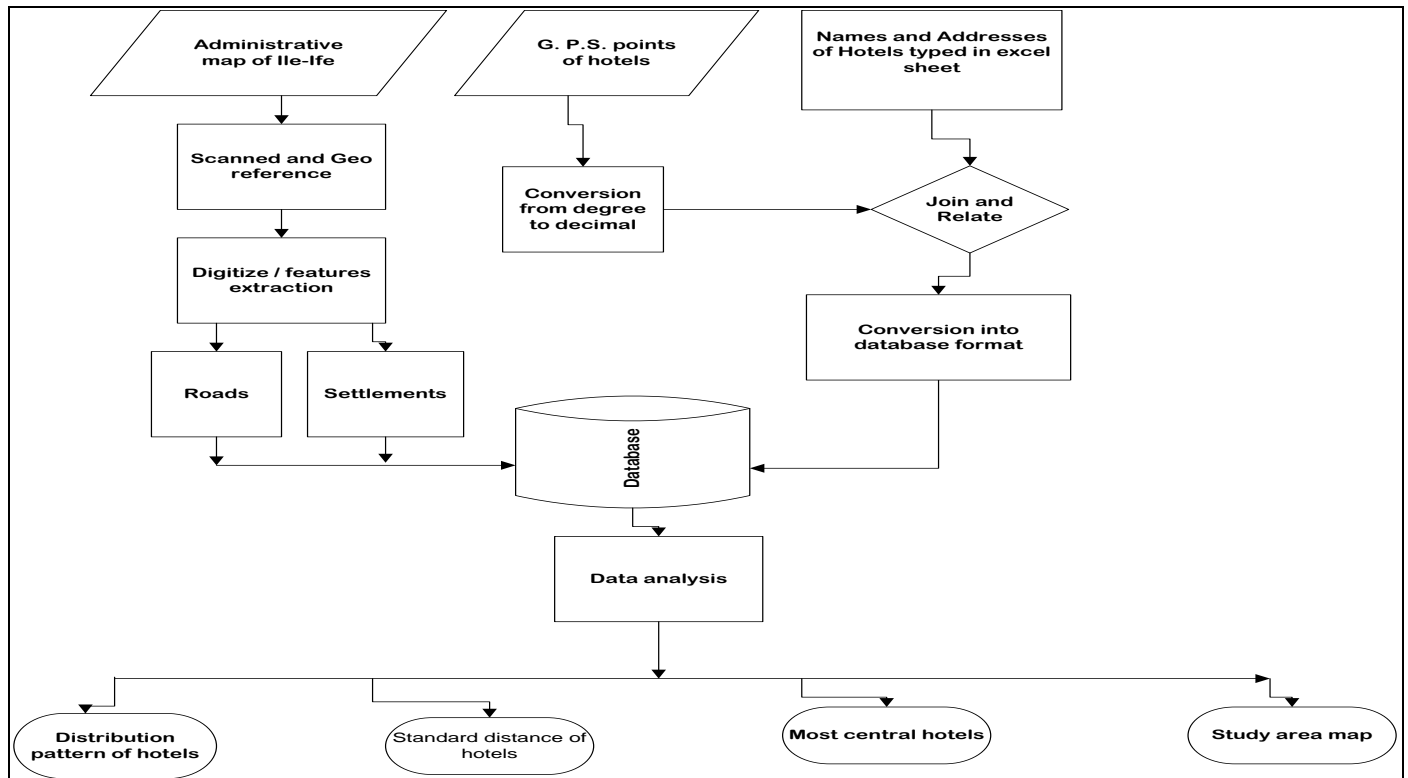
Fig 2: The Flow Chart

IV. RESULTS AND DISCUSSION

A. *Spatial Distribution of Hotels in Ile-Ife*

Forty-Seven (47) hotels were identified and located during the field survey of this research in the study area. Figure 3 below shown the distribution of the hotels.
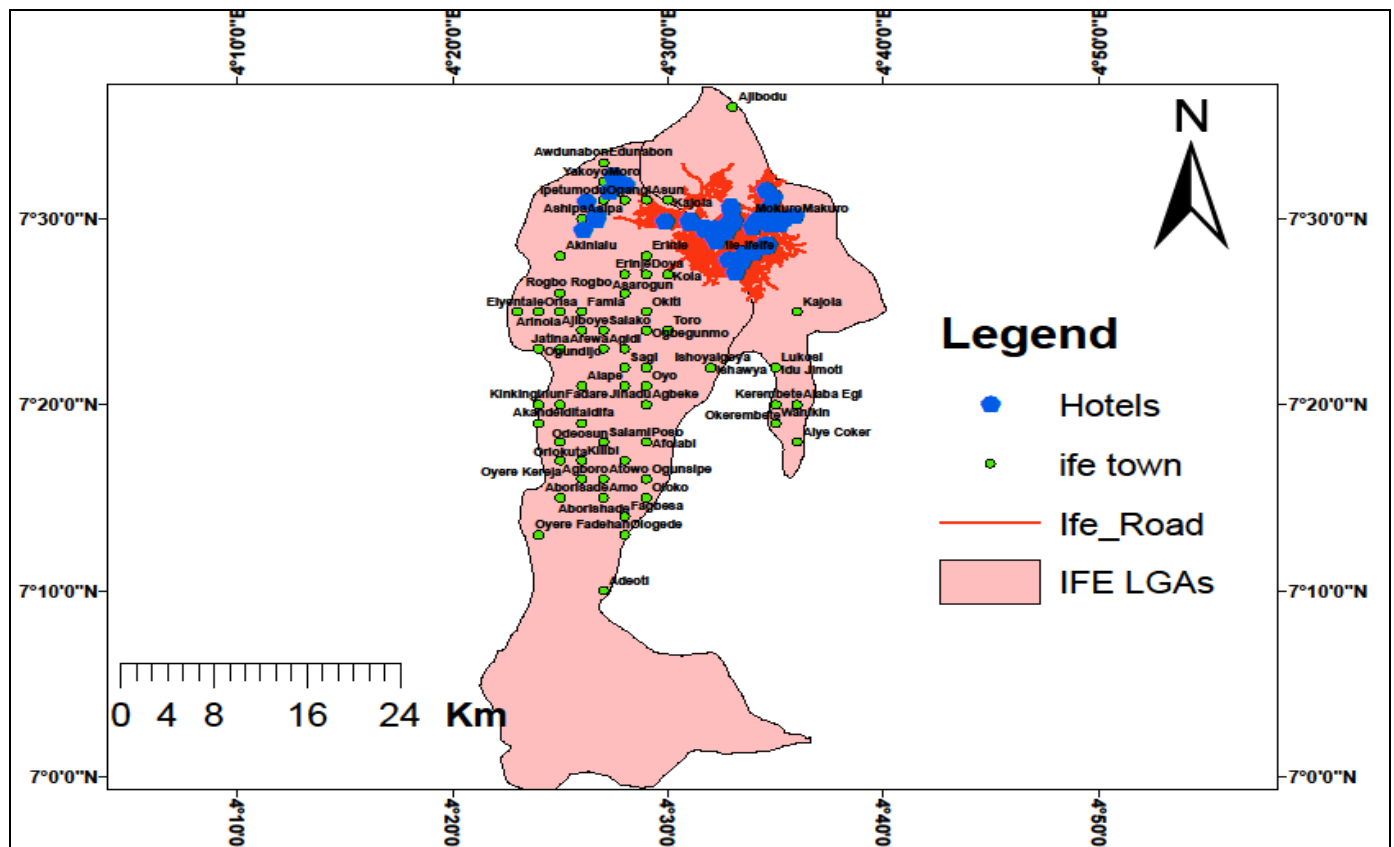

Fig 3: Map Showing Spatial Distribution of Hotels

➢ *The Identified and Located Hotels are Listed in the Table Below:*

Table 1: Names, Addresses and Coordinate Points of the Hotels

NORTHING	EASTING	NAMES OF HOTELS	ADDRESSES OF HOTELS
7.49559	4.58621	Abike guest house LTD	Back of Idita market, off Mukoro road Ile-Ife
7.51121	4.54810	Kriscourt hospitality LTD	Road 7gate, 1 Hezekiah oluwasanmi road Ife
7.48982	4.53410	Xelas hotels	Raymon Adedoyin way, Parakin, Ife
7.50837	4.57777	Hardrock guest house	Plot 9 and 10, Araloyin layout, Ife city college road, Ile
7.49951	4.44407	Horsfal hotels	Chief Obuye avenue, Akinola near Oduduwa University Ipetumodu
7.52554	4.57558	Olatoke hotels	Oke Opa, Ilesha road, Ife
7.51913	4.58137	Emerald Light hotels	Ifeloju quarters,line 3, Oladimeji, off Ilesha road, Ife
7.50038	4.58945	Afewonro hill hotel	Zone 2, oke sokun Quarters, off NTA rroad, Mukoro, Ife.
7.50009	4.56982	Glory suits hotel	8b, line 2a, Aladanla layout,Ife.
7.48017	4.53732	Hillsprings hotels	By Olarewaju junction, Ondo road, Modakeke Ife.
7.47677	4.57698	D and D global Investment	Back of Ilode Police post, Ife
7.46785	4.55775	Peace and love garden guest house	Along Ondo road, Omi-Okun, Ife
7.46043	4.55276	White house guest inn	Ondo road, Ife.
7.49727	4.58193	Olomitutu guest house	Mukoro road, Ife
7.53102	4.45987	Tolulope guest house	Behind St Jude primary school, Aiyepe, Moro
7.51543	4.43672	Jolade hotel	Opposite Police station, Ipetumode
7.49802	4.55014	Jao suits and hotels	17,Awoyeku street, Eleyele, Ife
7.49641	4.51689	New hotel Diganga	Km 1, Ife-Ibadan express way, Ife
7.50982	4.57832	Benediction hotels	Ife city, line 2, Ife
7.48958	4.54531	Celebration hotel	7, town planning road, Eleyele, Ife
7.49072	4.52935	Hotel De Treasure	Opposite Redeem Christian Church(region3), Ife-Ibadan express road, Ife
7.49587	4.57827	Galaxy hotel	Mukoro road, Ife
7.49189	4.52752	Cameron hotels LTD	Chief T. O. Oloyede's street layout, across Ajanakun estate, Ife-Ibadan express road Ife
7.49839	4.51624	Roots international hotels	10, Olubuse street Ife
7.53438	4.45916	Nifemak event center	Aiyepe street, Moro
7.47041	4.56576	Modupe memorial hotel	Balewu street, Iloro, Ife
7.48706	4.53355	Central Olympic motel	6, Ondo road, Near Obade Motor park, Modakeke
7.503734	4.44441	Green Paradise Palms hotel	New town area, Akinola road, Ipetumodu
7.50707	4.54845	Best friend hotels LTD	Hezekiah Oluwasanmi road 7, idi-obi, Ife
7.49098	4.53499	Hilton Hotels	Raymon Adedoyin way, Parakin, Ife.
7.49041	4.53415	Mayfair hotels	Raymon Adedoyin way, Parakin, Ife.
7.49894	4.56921	Wura hotels and suits	8, Aladanla layout, Ife
7.49655	4.54654	The green hotels	85, Eleyele layout Ife
7.49333	4.56535	Perfume garden hotels	Plot 77, Ojaja layout, Moore, Ife.
7.50243	4.59770	Omilaj hotels resturants	Km 5,Bonnke road, mukoro, Ife
7.53082	4.46641	Adex Unique guest house	Aiyepe area, Moro
7.53880	4.45755	Ife-Oluwa guest house	Power line area, Moro
7.52421	4.45436	Sobaloju hotel	Sorafaja road, Moro
7.49749	4.44742	Tunsol Hotel LTD	Opposite Oduduwa University, Ipetumodu
7.46295	4.54655	Twins Luxury hotel	By Iraye Junction, Ondo road, Modakeke
7.46054	4.55457	DACTOZ Luxury and suits	Ondo road, Modakeke
7.45179	4.55197	Grass root guest inn	Ondo road, Ife
7.46191	4.55700	Funal hotels and suits	Opposite St Peters grammar school, Omi-Okun, Ife
7.48784	4.54100	True Ivory suits and hotels	Beside 7th day Adventist primary school, Lagere, Ife
7.49686	4.55009	Seramo guest house	10, Awoyeku street, Eleyele Ife
7.49809	4.51668	Teragem guest house	9, Olubuse street, Ife

Source: Authors (2024)

B. Spatial Statistics

The Spatial Statistics toolbox contains statistical tools for analyzing spatial distributions, patterns, processes, and relationships. While there may be similarities between spatial and non-spatial (traditional) statistics in terms of concepts and objectives, spatial statistics are unique in that they were developed specifically for use with geographic data. Unlike traditional non- spatial statistical methods, they incorporate space (proximity, area, connectivity, and/or other spatial relationships) directly into their mathematics [8]. The following analysis were carried out using this spatial statistics toolbox

> ➤ *Central Feature:*

This identifies the most centrally located feature. Distances from each feature centroid to every other feature centroid in the dataset are calculated and summed. Then, the feature associated with the shortest accumulative distance to all other features (weighted is selected and copied to a newly created output feature class). The Central Feature tool is useful for finding the center when you want to minimize distance (Euclidean or Manhattan distance) for all features to the center. From the analysis it was shown that the most central hotel is Celebration Hotel at 7, town planning way Eleyele, Ile-Ife it is as shown below.
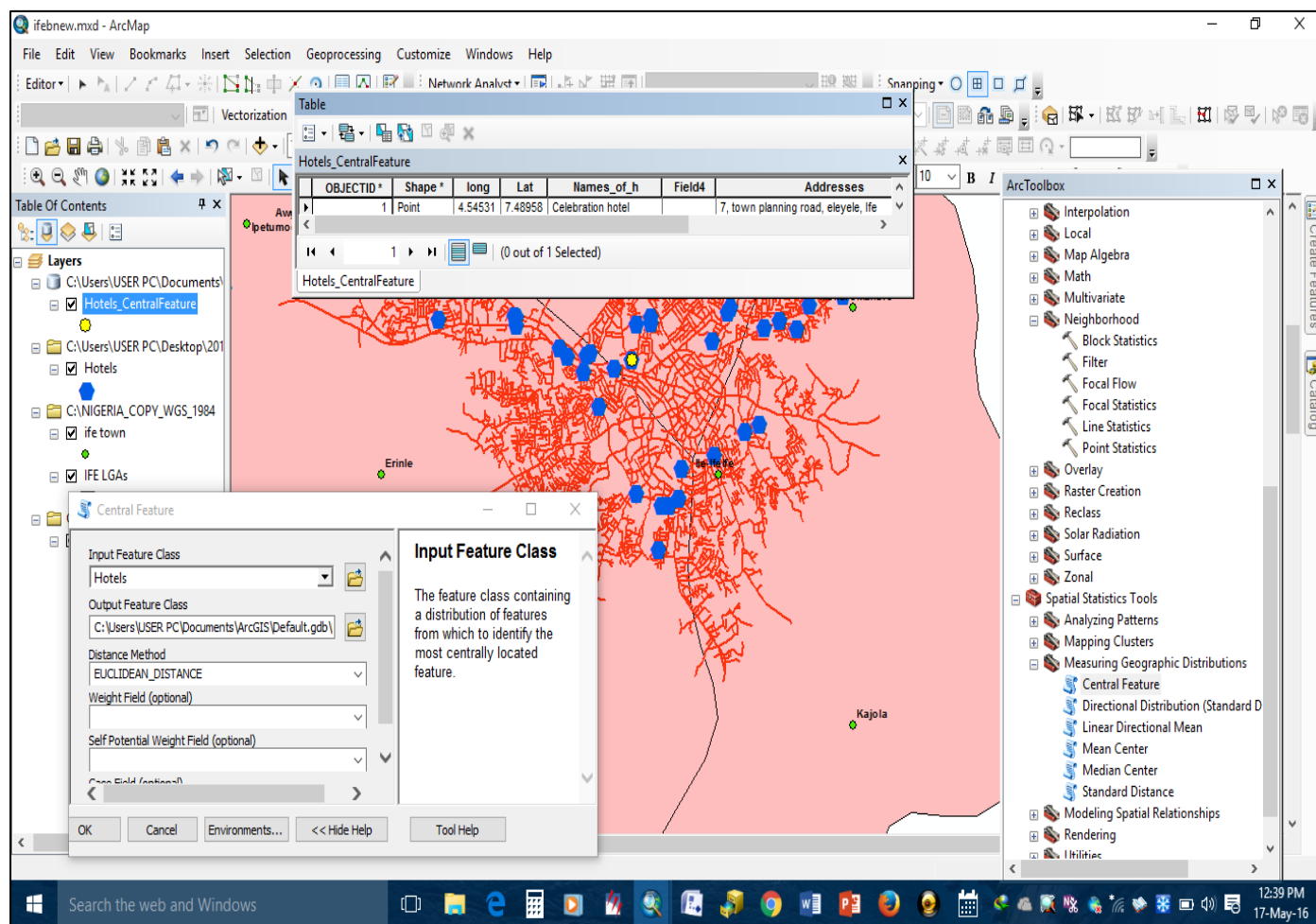

Fig 4: Map Showing the Central Hotel
Source: Adapted from ESRI ARCGIS 10.1 Desktop Help 2005-2012

> ➤ *Mean Center:*

The mean center is the average x- and y-coordinate of all the features in the study area. It is useful for tracking changes in the distribution or for comparing the distributions of different types of features. The Mean Center tool creates a new point feature class where each feature represents a mean center (one for each case when a Case Field is specified). The X and Y mean center values, case, and mean dimension field are included as output feature attributes. It is mathematically expressed as:

$$\overline{X} = \frac{\sum_{i=1}^{n} x_i}{n}, \quad \overline{Y} = \frac{\sum_{i=1}^{n} y_i}{n} \dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

where x_i and y_i are the coordinates of feature i and n is the total number of features present in the study area. There are forty-seven (47) total number of hotels and their respective x and y coordinates in the study area.

$$\overline{X} = \frac{4.58621 + 4.54810 + \dots + 4.51668}{47} = 4.534429$$

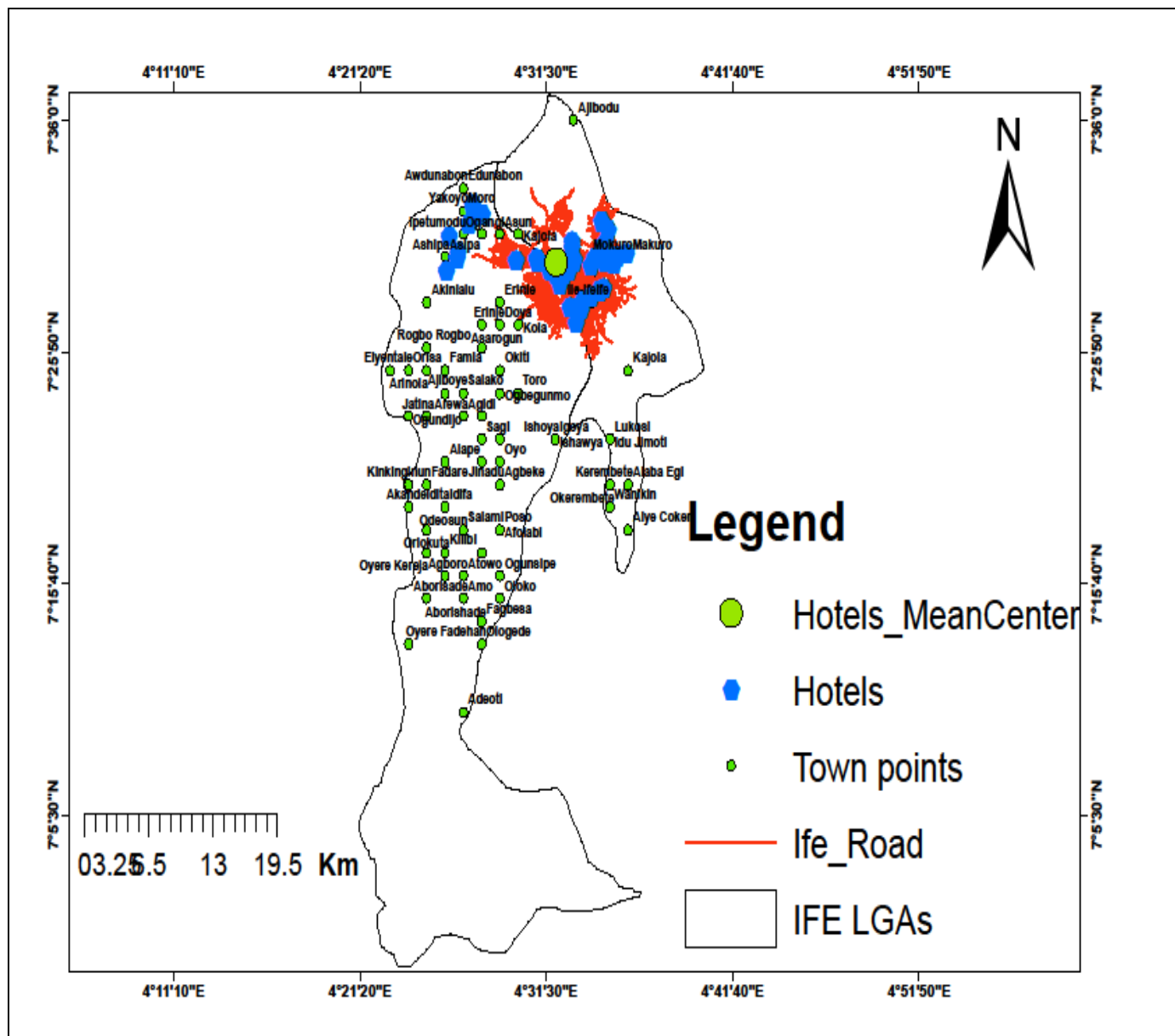$$\overline{Y} = \frac{7.49559 + 7.51121 + \dots + 7.49809}{47} = 7.495$$

Fig. 5: Map Showing the Mean Center of the Hotels

➢ *Standard Distance:*

Measuring the compactness of a distribution provides a single value representing the dispersion of features around the center. The value is a distance, so the compactness of a set of features can be represented on a map by drawing a circle with the radius equal to the standard distance value. The standard distance tool creates a circle polygon. The standard distance tool creates a new feature class containing a circle polygon centered on the mean center (one center and one circle per case, if a Case Field is specified). Mathematically, it is expressed as:

$$\text{SDE} = \sqrt{SDX^2 + SDY^2} \quad \text{……………………..……………} (2)$$

$$= \sqrt{[1/n \sum_{i=1}^{n}(x_i - \bar{x})^2] + [1/n \sum_{i=1}^{n}(y_i - \bar{y})^2]} \text{………...} (3)$$

Where

x_i and y_i are coordinates, n is number of features
And $\bar{x}$ and $\bar{y}$ define the mean centers.
n = 47, when i= 1, x_1= 4.58621 and y_1 = 7.49559
$\bar{X}$=4.534429, $\bar{Y}$=7.495965

$$SDX^2 = (4.58621\text{-} 4.534429)^2/47 + (4.54810 \text{-} 4.534429)^2/47 + \ldots + (4.51668 \text{-} 4.534429)^2/47$$

$$SDY^2 = (7.49559 \text{-}7.495965)^2/47 + (7.51121 \text{-}7.495965)^2/47 + \ldots + (7.49809 \text{-}7.495965)^2/47$$

$$\text{SDE} = \sqrt{(0.000057+0.00000031+ \ldots+ 0.0000067) + (0.0000000029+0.0000049 +\ldots + 0.00000018)}$$

$$\therefore \text{SDE} = 0.050104$$

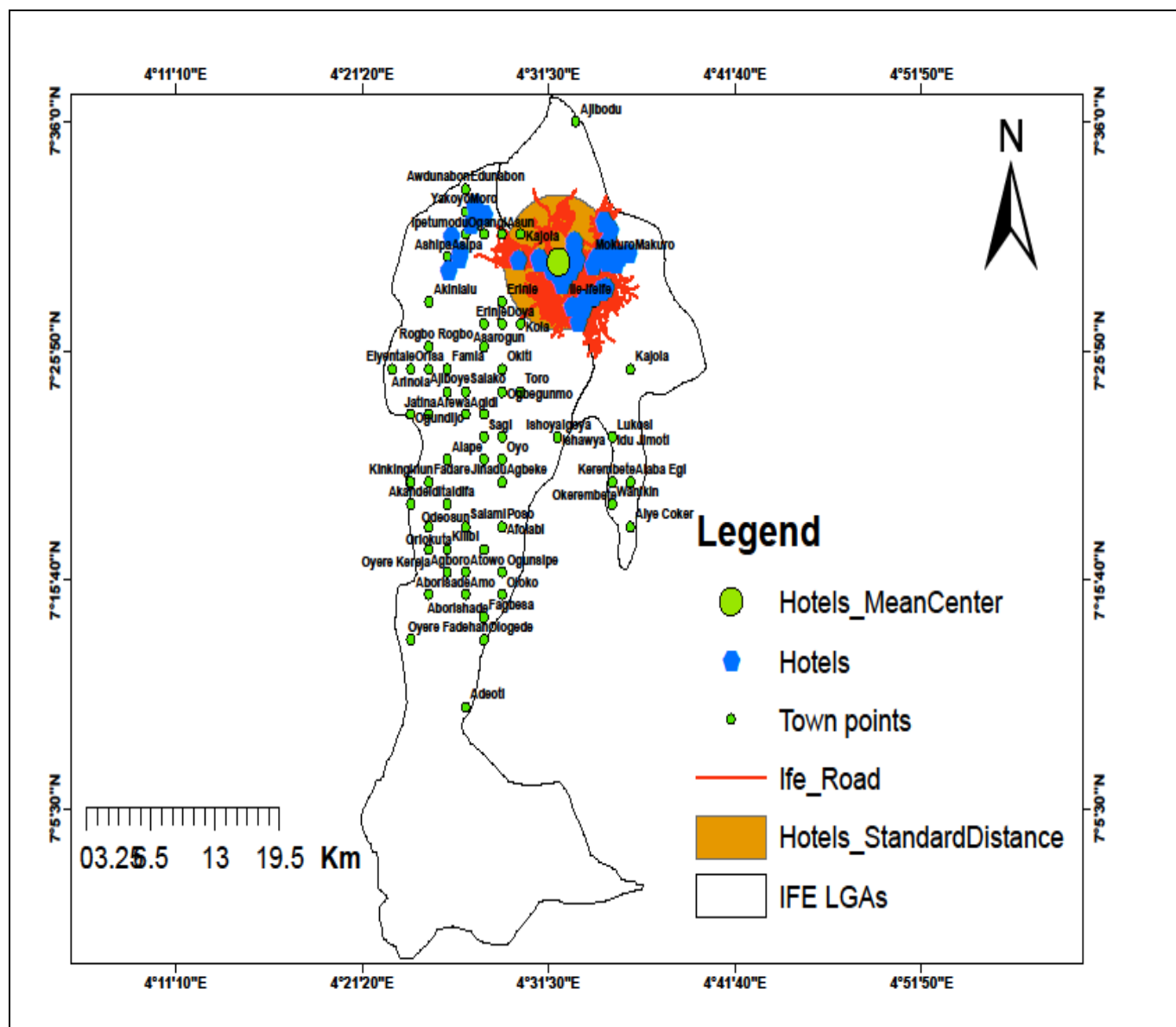> *This value is equal to the radius of the circle and the map is shown below:*

Fig 6: Map Showing the Standard Distance of the Hotels

> *Directional Distribution:*

A common way of measuring the trend for a set of points or areas is to calculate the standard distance separately in the x- and y-directions. These two measures define the axes of an ellipse encompassing the distribution of features. The ellipse is referred to as the standard deviational ellipse; the ellipse allows you to see if the distribution of features is elongated and hence has a particular orientation. The orientation of the distribution of the hotels is in the East-Western direction in the study region. This is mathematically expressed as:

$$SDEx = \sqrt{\sum_{i=0}^{n}(x_i - \overline{X})^2/n}$$
$$SDEy = \sqrt{\sum_{i=0}^{n}(y_i - \overline{Y})^2/n}$$

Where
x_i and y_i are coordinates, n is number of features
And $\overline{x}$ and $\overline{y}$ define the mean centers.
n = 47, when i= 1, x_1= 4.58621 and y_1 = 7.49559
$\overline{X}$=4.534429, $\overline{Y}$=7.495965

$$SDEx = (4.58621- 4.534429)^2/47 + (4.54810 - 4.534429)^2/47 + \ldots + (4.51668 - 4.534429)^2/47$$

$$SDEy = (7.49559 -7.495965)^2/47 + (7.51121 -7.495965)^2/47 + \ldots + (7.49809 -7.495965)^2/47$$

$$SDEx = \sqrt{(0.000057+0.00000031+ \ldots + 0.0000067)} = 0.066179$$

$$SDEy = \sqrt{(0.0000000029+0.0000049 + \ldots + 0.00000018)} = 0.025323$$
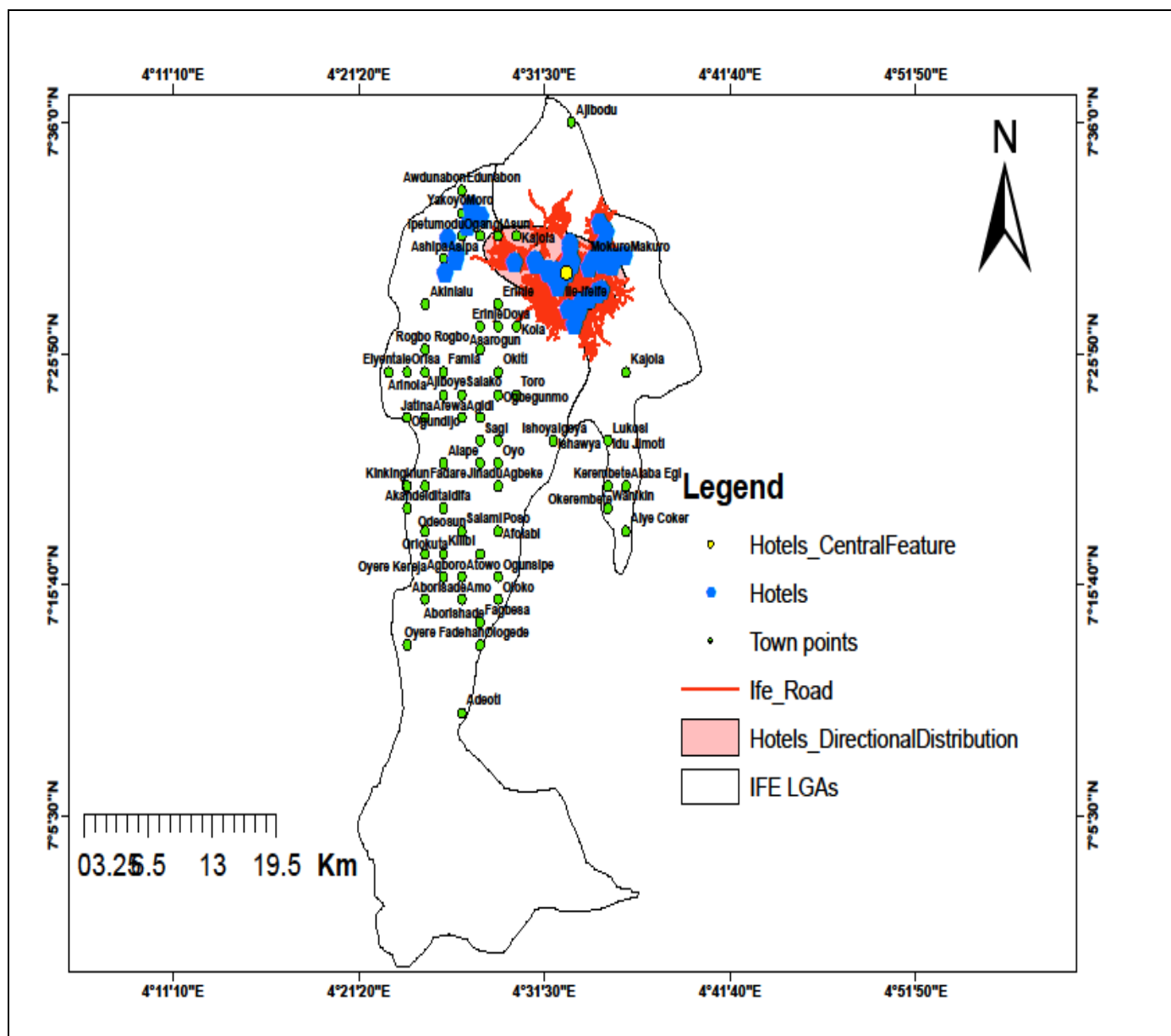
➢ *The Map is as Shown Below:*

Fig 7: Map Showing the Directional Distribution Of Hotels.

➢ *Average Nearest Neighbor:*

this tool measures the distance between each feature centroid and its nearest neighbor's centroid location. It then averages all these nearest neighbor distances. If the average distance is less than the average for a hypothetical random distribution, the distribution of the features being analyzed is considered clustered. If the average distance is greater than a hypothetical random distribution, the features are considered dispersed. The average nearest neighbor ratio is calculated as the observed average distance divided by the expected average distance (with expected average distance being based on a hypothetical random distribution with the same number of features covering the same total area).

Dispersed patterns are perfectly uniform. *Rn >1* which means that each point is equidistant. Random distributions occur where there is no pattern at all. *Rn = 1.0*. The Random pattern has a tendency for clustering or regularity. Clustering occurs when all the points are very close to the same point. *Rn <1*

It is expressed as $Rn = 2đ \sqrt{n/a}$

Where

Rn = distribution of features in the dataset
$đ$ = the mean distance between the nearest neighbor (km)
=0.004829
a = area under study (km^2) = 0.012172
n = total number of features under study= 47
$Rn = 2 \times 0.004829 \sqrt{47/0.012172}$

∴ $Rn = 0.600148$.

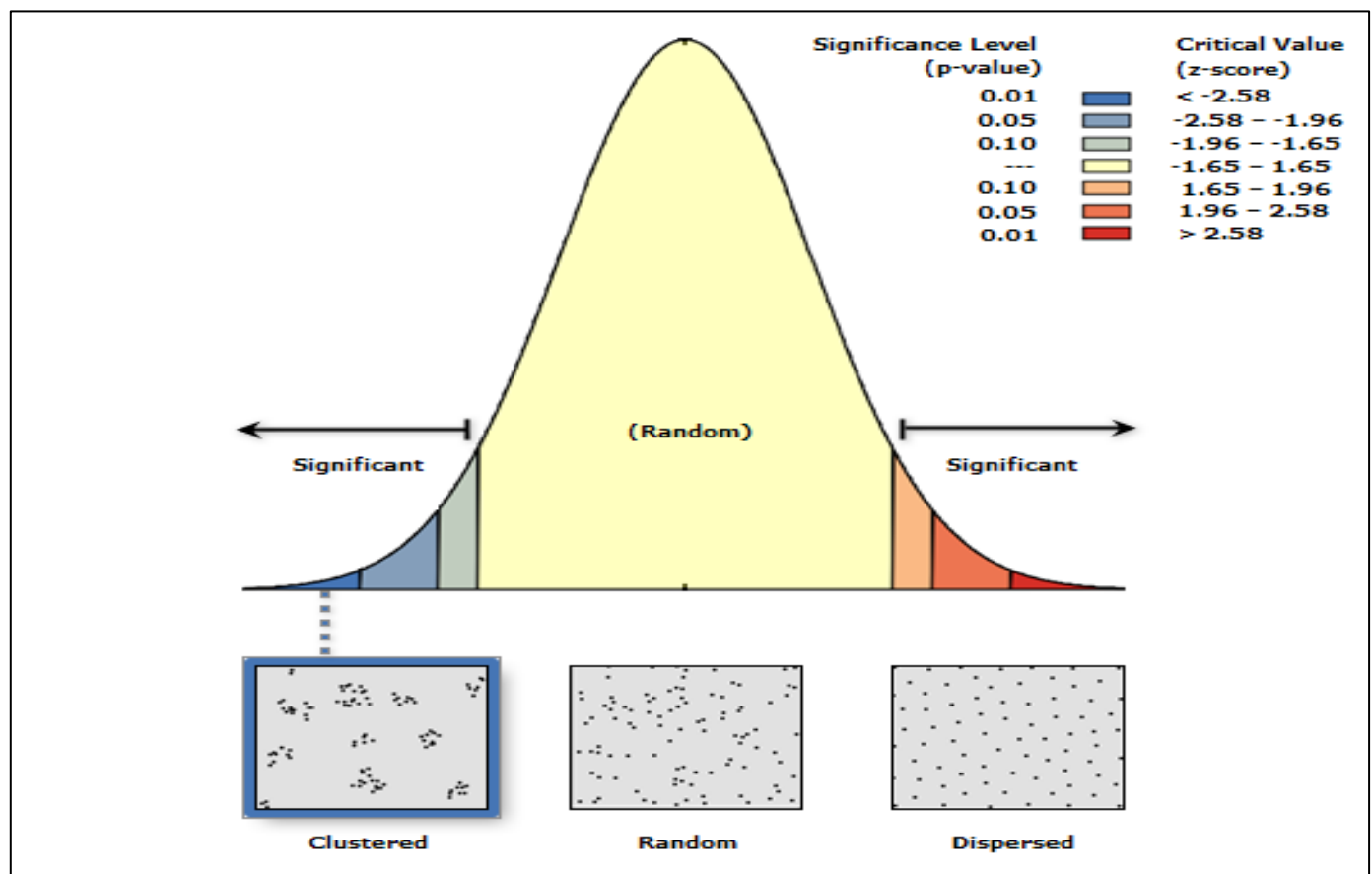➢ *This Agrees with the Clustering Pattern and as Shown Below:*

Fig 8: Showing the Average Nearest Neighbour of Hotels Which Is Clustered Pattern

Nearest Neighbor Ratio	0.600161
z-score: =	-5.244029
p-value: =	0.000000

The significance of this clustered pattern of hotels in Ile-Ife is traceable to some of these identified factors below and among others:

- Accessibility: there is good road network in Ile-Ife which guarantees easy accessibility to potential guests. [9] discovered that hotels close to potential market outperform their counter parts with poor accessibility in terms of efficiency.
- Ile-Ife is known to be the foremost and the famous historic town, the source of the Yoruba's in the south-western part of Nigeria hence, a tourist town with various tourism cites.
- Agglomeration effect is another factor to be identify. According to [10], defines agglomeration effect as the benefits hotels can receive from clustering. Clustering of hotels in Ile-Ife have some advantageous effects. This is seen from the fact that overfilled of one hotel would lead to movement into the neighboring hotels with vacancies, and among other advantages.
- On the part of guests, it would lead to cost reduction in searching for hotels with good quality of their choice.

V. CONCLUSION

The study revealed the spatial distribution of hotels in Ile-Ife and the pattern of distribution as revealed was clustered. It also shown the most centrally located hotel in the study area which was the Celebration Hotel situated at 7, Town Planning Way Eleyele, Ile-Ife. The study further revealed that the hostels are mostly situated in the East-Western direction in the study area as revealed by the directional distribution analysis.

The study concluded that GIS is efficient and dependable in showing how geographic features are distributed and related in a particular location.

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