CHAPTER FIVE

SITE LOCATION AND ANALYSIS

5.1 A GENERAL OVERVIEW

5.1.1 Brief History of Nigeria

Nigeria lies within the part of the world described as the tropics. This is the region that lies between latitude 23° 27' north to 23° 27' south of the earth’s surface. Within this area the sun is perpendicular at noon on at least one day of each year. For all the points in this region, the sun is almost vertically overhead during the entire year. The peculiar characteristics of the tropics include high amounts of sunshine, high amount of rainfall, high humidity levels, almost uniform weather throughout the year and high temperatures. Architectural design in the tropics must take into consideration the peculiar climatic features of this region.

Plate 5.1: Map of Africa showing the countries with Nigeria coloured in pink

Source: Abuja geographic information
5.1.2 Enugu

ENUGU STATE, South-East of Nigeria, is one of the thirty-six States constituting the Nigerian Federation. It came into being on August 27, 1991 when the administration of President Ibrahim Babangida finally acquiesced to the long agitations of Waawa people for a State they could truly call their own.

Enugu State derives its name from the capital city, ENUGU (top of the hill) which is regarded as the oldest urban area in the Igbo speaking area of Southeast Nigeria. The city owes its geopolitical significance to the discovery of coal in 1909 by a team of British geologists. The discovery of the solid mineral in the area brought about the emergence of a permanent cosmopolitan settlement which influenced the construction of a railway line to link the Enugu coal fields with the sea port in Port Harcourt for the export of the mineral.

In fact, by 1917 Enugu had acquired township status and assumed strategic importance to British interests. Foreign businesses began to move into Enugu, the most notable of which were John Holt, Kingsway Store, United Bank of West Africa and United Africa Company. By 1929, Enugu had become the capital of the former Eastern Region, and has since then retained its old status as the regional industrial and business hub as well as the political capital and rallying point of the Igbo people. (Egbokhare, Francis O.; Oyetade, S. Oluwole 2002).

5.1.2 Geographical Location

Enugu urban lies approximately between latitude 6° 21’ N and 6° 30’N and between longitude 7° 26’ E and 7° 37’E. The total area coverage is approximately 72.8 square kilometers. Enugu urban comprises three council areas Enugu North, Enugu East and Enugu South Local Government Areas. It is bounded in the east by Nkanu LGA, in the West by Udi LGA, in the North by Igbo-Etiti and Isiuzor and in the south by Nkanu West LGA. The predominant soil type is gravely-silt. It is mostly reddish in colour and has a high density bearing capacity for intense building construction. Like those of the rest of southern Nigeria, the soil ranks amongst the poorest Nigerian soils because of its low natural fertility. Although, they are light and easily worked, they are
incapable of supporting the high density rural and urban populations under rudimentary techniques of cultivation. This low fertility level of the soil has an adverse effect on the population of humus in the soil which subsequently leads to poor bacteriological reaction on wastes for speedy decomposition, soil deterioration within the area has reached catastrophic proportions and the diminishing agricultural output have pushed most of the farmers in the villages to give up farming entirely for search of greener pasture in Enugu urban.


5.2 THE STUDY AREA

5.2.1 Site Location and Analysis

Enugu city is one of the oldest city in Nigeria. It is made up of up about 13 residential layout namely; Camp, Old Ogui Layout, Ogui New Layout, Achara Layout, Abakpa Nike, GRA, Trans-Ekulu, New Haven, Agbani/Gariki, Ekulu East layout, Maryland, Ugwuaji, Independence layout and Emene.

The Premier Layout is a small layout being developed out of the new phase of Independence Layout currently called INDEPENDENCE LAYOUT PHASE II.
Premier Layout is a newly mapped out area in Ogui-Nike in Enugu North Local Government District. It is located along the Enugu-PortHarcourt expressway, just beside the new Independence layout Phase II. The layout has its main access road just directly from the intersection of Independence Avenue Road with the Enugu-PortHarcourt express. It is currently being developed by COPEN SERVICES LIMITED under the authorities of the Enugu State Government and being financed by the Federal Mortgage Bank of Nigeria.

Just beside the layout is the new Artisan Market which is still under construction although market activities are currently on-going there.

The layout currently has two (2) residential estates namely GOSHEN estate and JUBILEE estate. These estates has already been divided up into smaller residential units. But there is a wide expanse of land at the periphery of the layout which is designated for communal facilities which will include a shopping centre, church, business centre, etc.
5.2.2 Site Zoning

The Independence Layout Phase II as a newly mapped out area has a regular site shape, almost rectangular. This made zoning of activities there very easy since it will be more of a residential layout with few commercial and communal activities. The layout is zoned into the following areas:

- The Periphery
- Residential areas (Layouts and mini-estates)
- Communal area, which include the Commercial/Service Zone

Plate 5.4: Map of Independence Layout Phase II showing Site Zoning of activities

Source: Ministry of Lands and Survey, Enugu
5.2.3 Criteria For Site Selection

The site for the present Cathedral was chosen because it was the most central location from the old Enugu City when the only developed areas were Coal Camp, Market Road, Uwani, G.R.A and Okpara Avenue. From the first Master Plan of Old Enugu City, it was the most ideal location then. The presence of the Ogbete Market transformed that area to the Central Business District. This was the Old Enugu City. Futuristic growth of population and influx of people into Enugu especially when Enugu State was cut out from Old Anambra State were not taken into cognizance. This led to so many outbreaks of new layouts like Independence layout, New Haven, Agbani, Achara Layout, Trans-Ekulu, Abakpa and Emene. The expansion of the Ogbete Market and the present of Motor Parks in that area led to congestion, noise and heavy human/vehicular traffic.

The new Independence Layout Phase II is chosen as an ideal location for the new cathedral because the area is less dense and is a middle class suburb. The area is partially centralized because it is surrounded by most of the major layouts in Enugu metropolis and can be easily accessible. It is bounded by New Haven, Independence Layout, Abakpa, Emene, Ugwuaji and has an easy access from Gariki. The site is presently owned by the government and spans a large area of land suitable for siting all important facilities and structures needed in a cathedral, unlike what is obtainable in the present cathedral.

Another reason for this site selection is to control traffic and noise. Since this is a low dense residential environment, it is important that order is maintained. Church activities are generally associated with liturgical celebrations and prayer activities. Hence, the zoning of this site places the Cathedral in an area that is away from the hustling and bustling of the city life and activities thereby attaining the serenity required within a church environment.

Also, there are existing utility services like power lines which run along a defining route within the layout. It is therefore sufficient to hook onto these existing supply lines. The presence of the stream will help in drainage purposes.
5.3 SITE ANALYSIS

Enugu is in the hot humid zone 0.8° north and south of equator. There are two main seasons, namely:

- The dry season: The dry season is as a result of the North-East Trade Winds. This wind brought with it dust from the Sahara Desert and is by nature dry. This season lasts from November to March.
- The rainy season: The rainy season lasts from April to October; and is brought about by the prevailing moisture laden southwest winds that blow from the Atlantic.

5.3.1 Vegetation

The vegetation in Enugu state lies in two main vegetation zones: The Woodland and Tall Grass Savannah and the Rain Forest. The map below shows the vegetation zone which Enugu falls under.

Plate 5.5: Map of Nigeria showing vegetation zones.
Most common, are dumps of 20feet tall trees- commonly isoberline, locust bean, Shea butter, almond tree and oil bean trees that lose their leaves in the dry season and elephant trees covered the plains between the trees.

Within the proposed site, the natural vegetation cover has not been cleared. Elephant grasses and Bahama grasses are naturally occurring. There are trees both bordering the site and within the site. Some of them can be maintained to enhance landscape and provide serenity needed in a cathedral environs.

Plate 5.6: Project site showing dominant vegetation.

Source: Author’s Field Work

5.3.2 Soil Type

The Nigerian soil map published in 1967, divides Nigeria into four major soil zones namely:

- The zone of alluvial soil
- The south forest soils
- The northern zone of sand soils
- The interior zone of laterite soil

Enugu falls into the category of the interior zone of laterite soil. Laterite (a name which originated from the Latin word ‘Later’, meaning ‘Brick’) is a red tropical soil - a reddish mixture of clayey iron and aluminium oxides and hydroxides formed by the weathering of basalt under humid, tropical conditions. *(Microsoft® Encarta® 2009. © 1993-2008 Microsoft Corporation.)* Laterite is a dense,
porous, iron-bearing soil that can be quarried like stone and capable of withstanding intensive development. This is also the soil type found at the project site.

5.3.3 Winds

The two prevailing winds in Nigeria, and Enugu in particular, are the North East Trade Winds and the South West Monsoon Winds. North East Trade Winds blow from the Sahara in Northern Africa, and is characterized by the dryness it causes during the dry season, while the South West Monsoon Winds blows from the Atlantic Ocean, and is characterized by the wetness it causes during the rainy season. These two winds alternate twice every year.

![Mean wind force in Enugu State](Source: Department of Meteorological Services, Ibadan)

5.3.4 Sky Conditions

The sky condition depends mostly on the season. During the rainy season, the sky is normally cloudy, hazy and overcast. While during the dry season, the sky is most of the times, light and covered with white cumulus clouds. Early in the morning fogs may appear limiting visibility to as low as 100m, this is as a result of the dust in the wind.
5.3.5 Temperature

<table>
<thead>
<tr>
<th>Temperature</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily annual max. mean</td>
<td>29.3 - 32.6</td>
</tr>
<tr>
<td>Daily annual min. mean</td>
<td>21.8 - 23.8</td>
</tr>
<tr>
<td>Mean annual temperature</td>
<td>25.5</td>
</tr>
</tbody>
</table>

*Table 5.1: Mean temperature values for Enugu State.*

*Source: Department of Meteorological Services, Ibadan.*

*Figure 5.2: Mean monthly temperatures for Enugu State*

*Source: Department of Meteorological Services, Ibadan.*

Enugu is characterized by high temperature ranging from 27.43°C to 31.80°C (81.37°F to 89.24°F), within the period 1975 and 1985. The comfort conditions, as regards temperature, are 21°C to 26.67°C (70°F to 80°F) in the hot humid zones. Therefore for greater part of the year the temperature is above the comfort zones.
5.3.6 Rainfall

Enugu being in the hot humid zone experiences heavy downpour. The annual mean monthly rainfall ranges from 4.83mm to 317mm. Though January and December record very low rainfall, there is no month without rainfall. The peak of rainfall alternates between July and September, in August there is a little break in rainfall, which is normally referred to as August break.

5.3.7 Humidity

<table>
<thead>
<tr>
<th>Relative Humidity</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. annual mean relative humidity</td>
<td>85.3 - 95.4</td>
</tr>
<tr>
<td>Min. annual mean relative humidity</td>
<td>52.8 - 77.6</td>
</tr>
<tr>
<td>Mean annual relative humidity</td>
<td>77.5</td>
</tr>
</tbody>
</table>

Table 5.2: Mean relative humidity values for Enugu State

Source: Department of Meteorological Services, Ibadan
Figure 5.4: Mean monthly relative humidity for Enugu State

Source: Department of Meteorological Services, Ibadan

The relative humidity is high throughout the year. The mean monthly relative humidity ranges from 59.97 to 94.23, measured within the period 1975 to 1985. Consequently, the climate could be uncomfortable because body heat loss is low.

Table 5.3: Position of Enugu State on the globe (Source: Department of Meteorological Services, Ibadan)

<table>
<thead>
<tr>
<th>NOAA Station Id:</th>
<th>N165257</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latitude:</td>
<td>06°28’N</td>
</tr>
<tr>
<td>Longitude:</td>
<td>007°33’E</td>
</tr>
<tr>
<td>Elevation:</td>
<td>137m, 449’</td>
</tr>
</tbody>
</table>
Sunrise and Sunset Data

The yellow section shows when the sun is up, and how this changes over the year. Use the time-of-day scales, on the left and right, and the month scale on the top and bottom, to tell approximately when sunrise and sunset occur.

The sunrise and sunset times shown in the chart are approximate. They are accurate for the latitude, and show the precise amount of daylight, but the rise and
set times may be offset (up or down in the chart). The charts are made assuming that the location is in the middle of an evenly spaced time zone. For Enugu, Nigeria, latitude 06°28’N and longitude 007°33’E were used.

5.3.8 Topography Of The Site

The name “Enugu” was coined from the Igbo words “enu ugwu” which means “hilltop”. This name emphasizes the nature of topography of the state. The natural landform of Enugu state is interplay of hills and valleys, and the layout took the same form, although the topography flattened out in some areas especially around the proposed site of the project.

Despite its name meaning hill top in the Igbo language, Enugu lies at the foot of an escarpment and not a hill. Enugu is located in the Cross River basin and the Benue trough and it has the best developed coal in this area. Precambrian basement rock in this region is overlaid with sediments bearing coal from the Cretaceous and Tertiary age. Coal seams in the Enugu coal district measure between 1 and 2 metres (3.3 and 6.6 ft) in thickness and the reserves have been estimated to be more than 300 million tonnes.

Plate 5.7: Topographical map of Independence Layout Phase II and its surroundings. As can be seen, it is relatively flat.

Source: Google Map Data 2012
5.4 CLIMATIC ANALYSIS

5.4.1 Wind

The notable active winds operational on the site are the north-east trade winds and the south-west monsoon winds. These are seasonal with the south-west wind more predominant. The building should be oriented in such a manner to take advantage of these prevalent winds. Plate 5.8 below shows directions of prevailing wind on the site.

The prevailing wind is south westerly. With a maximum speed of 37Km/h. The south westerly monsoon and the hot northern harmattan are to be moderated by implementing green belts or barriers. Building arrangements and configuration will take the wind into consideration.

Plate 5.8: Map of Nigeria showing wind pattern.


5.4.2 Sun Path

Because of the rotation of the earth on its axis from west to east, the movement of the sun is from east to west. This gives rise to the sun rising from the east in the morning and setting in the west in the evening. The morning sun in the east is very mild, whereas the sun in the afternoon is harsh and scorching. A good
knowledge of this will help the designer to ensure proper orientation of the building on the site.

### 5.4.3 Noise Source(s)

There is no major source of noise into the site since the site is well away from the roads and other noise generating activities. Meanwhile slight noise may be filtering in from the express road on the east axis and also from vehicles moving within the layout. But this will be buffered with the presence of the stream and the vegetative growth around the site.

### Figure 5.6: Site Analysis

*Source: Author*

### 5.4.4 Orientation of Building

The prevailing wind in Enugu is southwest and northeast trade winds. Therefore, orienting building in east-west direction will not allow good airflow through it.
The wind will be heating the building at angle 45°, forcing a part of it to go parallel to the building, while the rest will go through the building. The east or west end of the building (depending on the direction of the wind) will be without air movement.

The volume of air movement through the building depends upon the force with which the wind hits the building. If the force (speed) is high, a greater part of the wind will be deflected parallel to the building, leaving the interior with a minimal air movement.

Figure 5.7: Different Building Orientations

Source: Time-Saver Standards for Building Types

Orienting buildings at 45° to the horizontal, will allow the two prevailing winds in Enugu pass through them undisturbed. It’s being undisturbed means that it will be moving with its normal speed, (which may be high or low). If the speed is
high it may not be good for people and as well will pass without proper circulation in the building. However, if the speed is low and acceptable it will be the best orientation for ventilation purposes.

All the same the solar radiation incident on the building will be too much and as such not a good orientation in the tropics.

The third orientation possibility is at $22^\circ30'$ to the horizontal. At this position the wind speed is lowered causing it to circulate more evenly of sun radiation is lowered to a manageable quantity.

This quantity of solar energy allowed into the buildings help in deodorizing the building interiors. It heats up the air inside the building interiors, which is then displaced by cooler air from outside – this is most obtainable in the morning hours.

5.4.5 Parking Consideration

Parking considerations for cars and other vehicles is of utmost importance since the Cathedral and other facilities in its compound like the Diocesan Secretariat attract regular influx of people on dialy basis. Most of car users comprises mainly of people coming for liturgical celebrations and people visiting the Diocesan Secretariat and other facilities on site.

The area of one parking space should be $15\text{m}^2$ per a car. The distance between cars parked and the Cathedral Church building should not be miles apart as being sited within the tropics, the challenges of rainfall and environment access to shade will be a very convenient consideration.

A common parking lot is advisable for such a big church complex instead of pockets of parking lots to aid adequate security of the cars and gives room for better circulation of vehicles.

Also to curb excess heating of cars as a result of the heat of the sun, the use of shrubs and ornamental plants as sun shading elements will be employed for the cars and the paths in and around the Cathedral compound.
5.5 LAND USE ANALYSIS

Plate 5.9: Land Use Analysis of the project site and its surroundings

Source: Author

5.5.1 Analysis

A) The new artisan market close to the layout constitute the highest noise infiltration into the project site. This market will attract more dwellers into the layout in the nearest future, thus the new cathedral will be able to function fully with a growth in the Catholic community.

B&C) There are presently two mini estates; Goshen Estate and Jubilee Estate. These estates bound the project site at the east and south respectively. They are
still developing estates and have not been fully inhabited. The inhabitants who are catholics will form the new congregation the parish will have as presently, there are no Catholic Church in the estate and none in its proximity.

D) This is the project site for the proposed new Cathedral for the diocese. This site is just at the beginning of the layout and covers a wide expanse of land. There are few umbrella trees on the site which will provide shade and aid the movement of air. They will also act as noise buffers.

E) There is a small stream flowing across the entrance road into the layout and it is close to the project site. The presence of this stream improves the micro-climatic conditions of the site and will also help in buffering noise entering the project site. This stream will also help a great deal in water drainage from the site.

F) This shows the overhead bridge linking the phase I of Independence layout to the Phase II where the project site is located. The street that terminated at the overhead bridge is called Ezillo street. Residents from Independence Layout and part of New Haven who live close to this new layout and who wishes to worship at the new cathedral can easily access it from this overhead bridge.
REFERENCE


