



Demystifying Working Environment through Sustainable Design: Senate Building Design Proposal for Caleb University

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ABSTRACT

Climate change is a phenomenon that poses a great threat to humanity, the built environment and construction projects. Our structures contribute one third of total carbon dioxide emissions to the atmosphere, a sobering fact when confronting global warming's effects, which include the melting of polar ice caps or glaciers and an increase in storm activity. While some stubborn few still dismiss carbon emissions as the culprit, no one can dispute the skyrocketing costs of energy. It is important to iterate the fact that architects, directly or indirectly, play a huge part in the creation of better working environment for sustainable design. Similarly, increased extreme weather events and air temperatures affect the health and safety of workers in a defined space. The significant role of Climate Change and its effects on our ecological system are contemporary issues being given more attention in recent times in regards to architectural and design practices. In view of this, the paper tends to showcase the need for sustainable working stations and office environment which are becoming more demanding in its energy efficiency and Zero- carbonation. Thereby creating a productive working environment as established in the design proposal of senate building for Caleb University Lagos, Nigeria.

Key words: Sustainable design, Architecture, Climate Change, Senate Building, Architecture
Zero-carbon

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1. INTRODUCTION

The significant role of Climate Change and its effects on our ecological system are contemporary issues being given more attention in recent times in regards to architectural and design practices. In view of this, the need for sustainable working stations and office environment are becoming more demanding and some may even claim that a more energy efficient office building and a zero-carbon office building shall result in to more efficient and productive working environment. Architects in this era are therefore charged with the responsibility of providing for this increasing need for energy efficient buildings. In turn, office owners and managers are also placed under increasing obligations to be focused on the reduction of production costs and to find more sustainable ways of going about their business endeavors. Companies are coming to the realization that investing in '**Green**' principles is profitable and more importantly, beneficial to human race on the long run.

1.1 Fundamental concept of Green Principles for Architecture design

Green architecture strives to minimize the number of resources consumed in the building's construction, use and operation, as well as curtailing the harm done to the environment through the emission, pollution and waste of its components (Amany Ragheba , Hisham El-Shimy , Ghada Raghebb 2014).To design, construct, operate and maintain buildings energy, water and new materials are utilized as well as amounts of waste causing negative effects to health and environment is generated.



In order to limit these effects and design environmentally sound and resource efficient buildings; "green building systems" must be introduced, clarified, understood and practiced. Amany et al. (2014) emphasized that Green architecture, or green design, is an approach to building that minimizes harmful effects on human health and the environment. The "green" architect or designer attempts to safeguard air, water, and earth by choosing eco-friendly building materials and construction practices, defines an understanding of environment-friendly architecture under all classifications, and contains some universal consent.

Thus, it may have many of these characteristics, ventilation systems designed for efficient heating and cooling, energy-efficient lighting and appliances, water-saving plumbing fixtures, landscapes planned to maximize passive solar energy, minimal harm to the natural habitat, alternate power sources such as solar power or wind power, non-synthetic, non-toxic materials, locally-obtained woods and stone, responsibly-harvested woods, adaptive reuse of older buildings, use of recycled architectural salvage, efficient use of space. While most green buildings do not have all of these features, the highest goal of green architecture is to be fully sustainable. The paper tends to showcase in this design proposal the need for sustainable working stations and office environment which are becoming more demanding in its energy efficiency and Zero-carbonation. thereby creating a productive working environment as established in the design proposal of senate building for Caleb University Lagos, Nigeria.

1.2 The Brief

The brief is to design the Senate Building for Caleb University to accommodate the day-to-day functions of its administrative staff. This building should provide accommodation for the office of the Proprietor, office of the Chancellor, office of the Pro-Chancellor, office of the Vice-Chancellor, Office of the Deputy Vice-Chancellors, office of the Registrar, office of the Bursar and other facilities that would assist in the smooth running of Caleb University Administration. The building should also accommodate the Council Chamber and the Senate Chamber.

Analysis of this brief shows that the functional spaces can be grouped according to the estimated population of its users, this grouping is as follows;

- Low Population Areas - highest ranking officers
- Medium Population Areas - University administrative offices
- High Population Areas - public spaces, student prone areas, conference areas

The scope of this Senate Building proposal is to accommodate the administrative core of the university. This shall include the following principal offices among others:

- I. Proprietor's office.
- II. Chancellors and Pro-Chancellors office.
- III. The Vice-Chancellor's office.
- IV. The Registrar's office which includes the registry for general administration of the university.
- V. The Senate Chamber, where the University Senate shall converge for meetings.
- VI. The Council chamber situating the place of meeting for the University's Council.
- VII. The Bursar's office and the general bursary for the day-to-day running of finances and accounting for the university's transactions.
- VIII. The office of the Public Relations Officer.
- IX. The office of the Chief Security Officer.

1.3 Aim and Objectives of the Design

The design of the Senate Building is aimed at achieving a better working environment for the administrative offices in Caleb University.

The objectives of the design are to:

1. Provide for office accommodation for the administrative staff of the university;
2. Enhance mutual interaction and unity among the workers;
3. Allow for the accommodation for other facilities to meet the present and future need of the University; and
4. Suggest ways of achieving better working environment through sustainable design.



2. DESIGN MORPHOLOGY/CONSIDERATIONS

2.1 Site Selection and Analysis

Site selection is concerned with the choice of site from amongst other options. This is done by considering a certain factors which influence development of a particular spatial activity. The site with minimum problems and maximum benefits is usually selected for the project.

Consequently, it is very important that a careful and thorough analysis of site must be carried out before any design proposal can be initiated. Among those selections that influence choice of site include topography, soil type, and vegetation.

In this section, site selection and analysis shall be discussed under the following headings:

- Campus Location and Size,
- Existing Physical Structures in the Campus,
- The University Master Plan,
- Site Selection Criteria,
- The Project Site,
- Climatic Analysis, and
- The Design Implication of Climatic Analysis.

Campus Location and Size: Caleb University is located along the Ikorodu-Itokin road in Imota, Ikorodu North Local Council Development Area (LCDA) in Lagos State, in the South-West region of Nigeria. Its location is about fifteen (15) kilometres from Ikorodu centre (a major round about at Ikorodu).

The campus is bounded on the south by the proposed site for Caleb University College of medicine, to the east by a residential community (Imota), to the west by a residential community (Isiu) and to north is a natural forest area.

According to the details on the master plan provided, on completion of the entire developments in the university, the site of the university is estimated to be about 1,117,597.138 Km² (111.76 hectares).

Existing Physical Facilities: Caleb University currently has about eleven (11) facilities built on its campus since its inception in 2006, with currently three facilities ongoing construction. It has only just about over twenty percent (20%) of its master plan developed. However, development is observed to be as the population increases (i.e. an increase in the population would demand a need for more facilities).

Regarding the landscaping of the University, much effort has been put in place to provide appropriate gardens. However, there is little or no effort in creating recreational areas apart from the University Sports Arena. The College of Pure and Applied Sciences block and the two (2) undergraduate halls of residences are far to date the only buildings being landscaped while the others are partly lavished with hard landscape. The university has laid more emphasis more recently on producing the required facilities that are needed for the smooth running of the institution's academic programme and preservation of its natural vegetation.

Roads have been provided to facilitate easy transportation for its current development level, but the idea of pedestrianism was not considered during the planning stage. It however considered pedestrian movement when landscaping its new College of Environmental Sciences and Management building but, its user experience was not considered, students rather walk through the lawn than take the path provided for movement.



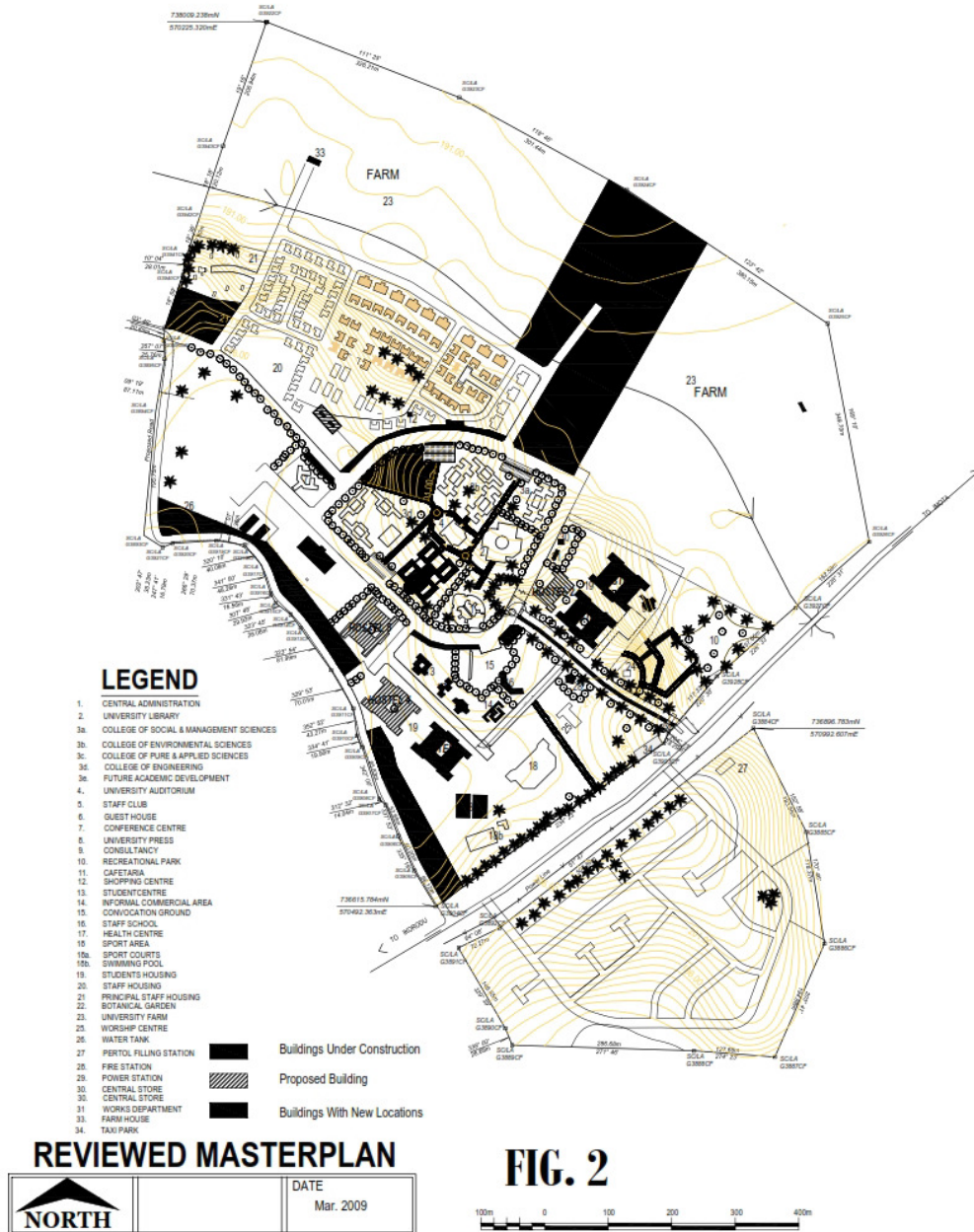
The Master Plan: Stated below are the facilities proposed in the universities master plan:

- Central Administration
- University Library
- University Auditorium
- College of Pure and Applied Sciences
- College of Social & Management Sciences
- College of Environmental Sciences
- College of Engineering
- Future Academic Development
- Staff Club
- Guest House
- Conference Centre
- University Press
- Consultancy
- Recreational Park
- Cafeteria
- Shopping Centre
- Student Centre
- Informal Commercial Area
- Convocation Ground
- Staff School
- Health Centre
- Sports Area
- Sports Courts
- Swimming Pool
- Students Housing
- Staff Housing
- Principal Staff Housing
- Botanical Garden
- University Farm
- Worship Centre
- Water Thank
- Petrol Filling Station
- Fire Station
- Power Station
- Central Store
- Works Department
- Farm House
- Taxi Park
- Postgraduate Housing
- Bakery
- Water Factory
- Mass Communication Building

The layout of the above-mentioned facilities is shown in the Master Plan in the diagram below. The site proposed for the university Senate Building (Central Administration) is labelled “1”.



PROPOSED CALEB UNIVERSITY IMOTA, LAGOS STATE



Caleb University Master Plan



Site Selection Criteria: The success of a great design depends on the site selection. The overall character of the site has a great influence on the design programme and the effective performance of the building in total.

For purpose of this project, the criteria to be considered for the selection of the proposed site are listed below:

- Accessibility
- Proximity
- Visual Appreciation
- Height Level
- Security

Accessibility: The proposed site must be accessible from all parts of the academic environment. The building should be located within the academic core of the university, and should also be in close proximity to the main auditorium and University library as these facilities are mostly used by the administrative officers of the university. For campuses where cars are the major means of transportation, the Senate Building becomes more accessible only if there is an ample parking lot near-by, as in the case of UNILAG, Senate House. If the building is to be used for Senate meeting, easy accessibility from the major academic pedestrian approach is vital as it would reduce the carbon-foot print in its immediate environment.

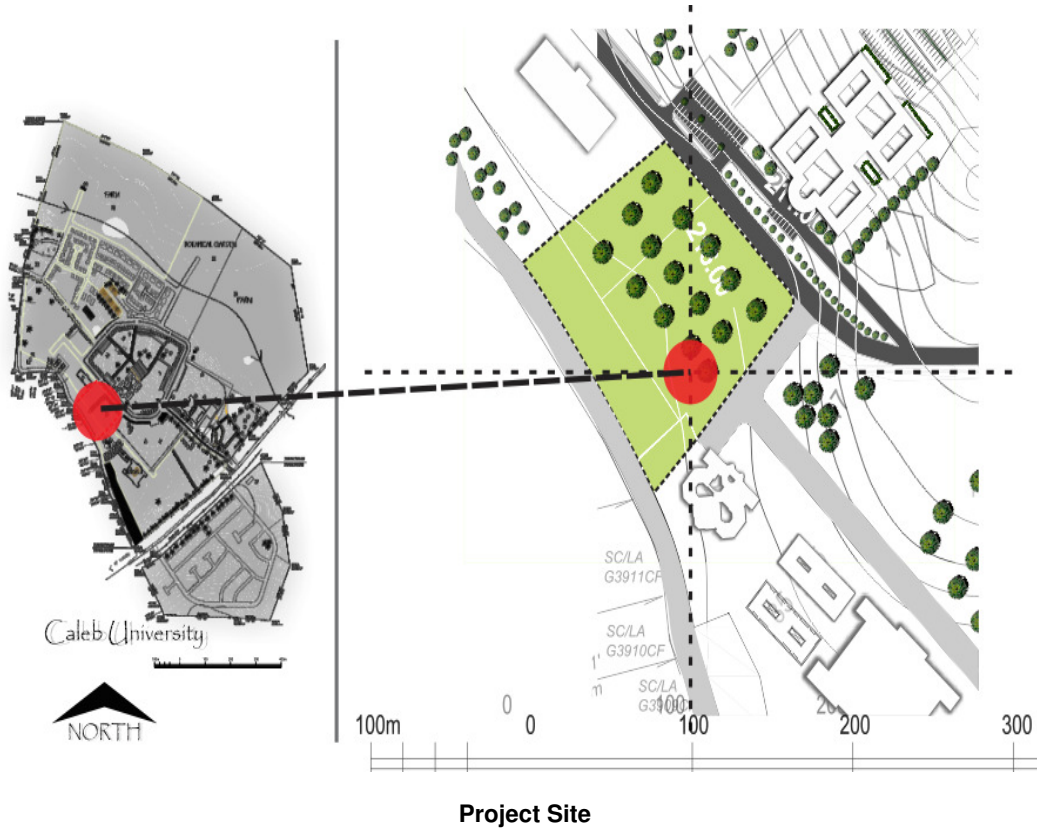
Proximity: The site proposed for the Senate Building should be located around the academic core of the institution. The location should be such that it is convenient for the institution's staff at various parts of the academic environment. The location should also have a good proximity to the staff housing and the entrance of the institution. This was observed to be a key factor during my field study as institutions that have good proximity to the academic core and access from the institutions have better performance.

Visual Appreciation: The site for this building should not only enhance the building but the context of its environment as a whole. When buildings are strategically spaced, the context of the urban form is more appreciated than when they are clustered together. As seen at the University of Lagos, where efforts had been made to strategically space their structures so as to achieve good visual appreciation of the urban form and the buildings in context.

Height Level: Unlike relatively flat urban forms, where the difference between ground levels of the structures are negligible, Undulating terrains a good example of Caleb University, where there is a difference of about twenty (20) metres from the highest to the lowest point on its urban form, it is very important to consider locating the seat of power around the peak of the urban form. A good example of Greek Architecture, where the Acropolis (City of gods) was located at the highest point in Greece, Mount Olympus, to show its authority.

Security: Since the building is the seat of power, its site should be able to provide adequate security facilities such as alternate access point to the sites. It is important to note that there would be no true justification for locating a Senate Building on a site which does not possess the factors mentioned above. The resultant of such location is that, the administrative block would not perform effectively and would be underutilized by the institution's staff and the university in general. In general, a site could be considered as good for a Senate building if it is located strategically within the academic core with a proportionate proximity to the staff housing and the access to the institution.

The project Site: The site for the Senate Building for Caleb University is located within five hundred (500) metres radius of the main gate and about six hundred (600) metres going through the university main road. The site is bounded to the south by the ongoing Mass Communications Building, to the north by the College of Pure and Applied Sciences block and the Cafeteria and to the west by the current sports arena. It is bounded by a road and a minor road that intersects at the southern part of the site. In order words, it is a "corner-piece"

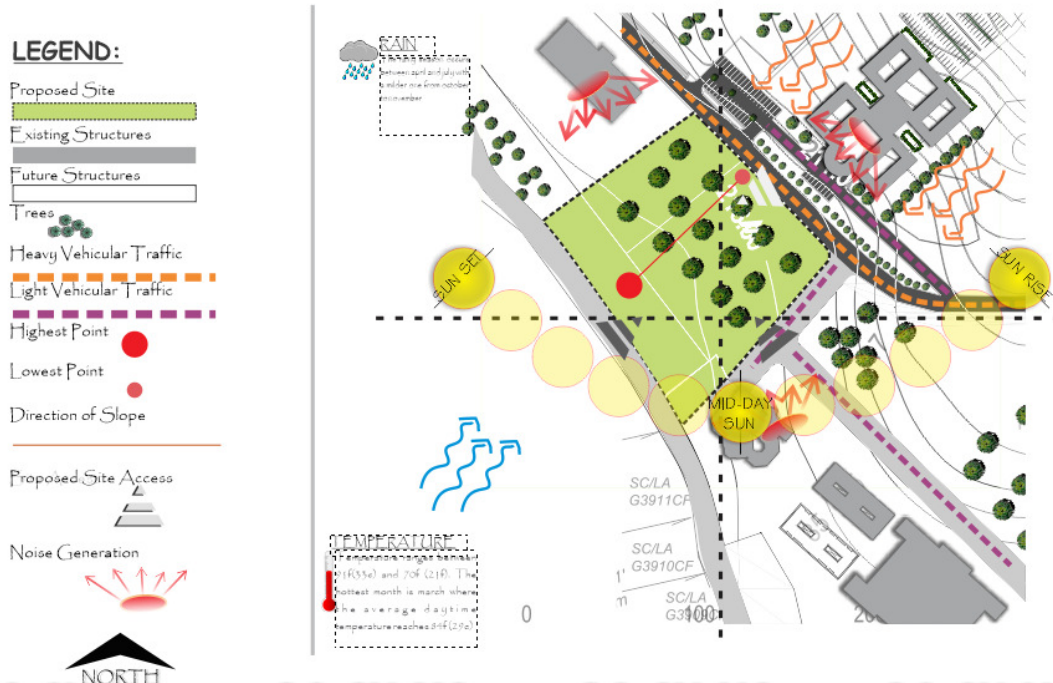


Its advantage is that it is within proximity of the academic sector of the institution. As majority of its officers and staff would find it easy to access through pedestrian walk ways and paths. Another advantage of its location is that the site can easily be serviced from the university's second entrance.

The site has already been connected to the essential services. This services will only need to be extended the proposed site for the building on completion.

Climatic Analysis: This bothers on the effects of geographical and environmental factors on the site. These factors shall be discussed under the following headings:

- Topography
- Vegetation
- Soil Type
- Rain Fall
- Temperature
- Wind
- Relative humidity



2.2 Site Analysis

Topography: The proposed site for Caleb University Senate Building is relatively flat with a gradient of approximately two degrees. It slopes towards the university road. Good drainage system should be used to ensure that there will be no erosion menace at the completion of construction.

Vegetation: Lagos is situated in the forest belt fresh water swamp to be precise. This type of vegetation is experienced inland, where tide cannot reach, the land is also free from sea water but has constant supply of water from heavy rainfall. The project site is partly overgrown with grasses and trees.

Soil Type: Lagos being on the coast is noted to have alluvial soil type which is as a result of the ocean deposits. The surface soil on the Caleb Urban is seen to be red laterite (clay). It is marshy when wet, if it is not compact, can easily be washed away.

Rainfall: Lagos, in view of its location in the equatorial zone is bound to experience rainfall almost throughout the year brought about by the South-West Trade wind from the Atlantic Ocean. Lagos experiences more rainfall between May and July followed by a dry season in August and October giving rise to what is regarded as a Double Maximum period of rainfall which at times experiences days of continuous rainfall.

Wind: Lagos experiences two major types of wind. Namely the South-West trade wind and North-East trade wind. The South-West trade wind prevails from April to October. The wind current originates from the Atlantic Ocean. The North-East trade wind on the other hand originates from the deserts. This wind is associated with dryness and dust, consequently, harmattan.

Relative Humidity: Lagos is seen to fall under the warm humid climate with a very high percentage of moisture content in the atmosphere. This means that very high temperature would be experienced at noon. The rainy seasons are usually more humid with June at its peak.



Climatic Problems: From the environmental analysis above, it can be deduced that the site is characterized by the following climatic problems.

- High daily temperature range
- High wind speed
- High humidity
- High radiation

Design Solutions: The design solution to the climatic problems shall be discussed under the following headings:

- Daily Temperature Range
- Wind
- Humidity
- Solar Radiation

Daily Temperature Range: This can cause contraction and expansion of materials used for construction. One way of solving this problem is by using materials with appreciable expansivity and also integrating the use of expansion joints to accommodate the expansion as a result of daily temperature rise.

Wind: Due to the nature of wind which is fast moving, the roof of the structure should be well anchored to avoid being blown off in the occurrence of strong wind or storm.

Humidity: The climatic problems due to humidity can be solved by the use of building materials and good finishes that can resist high moisture and the salinity of the air around the site.

Solar Radiation: The solution to the effects of solar radiation may be solved through the following measures:

Orientation: This has to do with the proper placement of the building using the cardinal points as guides. This is a very important aspect of the design, which must be critically studied as its orientation affects the level of impact on the building by the rays of sun. For the tropics, the best orientation is the one in which the longer façades of the building are facing the north and south. This is because more radiation is experienced at the East and West sides.

Use of Trees and Shrubs: Trees and shrubs can be used to shade the building from direct solar radiation. The trees, in this case, collect some parts of the rays of the sun that could have fallen directly on the building, thus reducing the effective impact of the rays on the building. **Shading Device:** There are several forms of shading devices that can be employed to reduce solar radiation. These include Horizontal shading, Over-hangs, Vertical Shading Device, Louvre blades, Egg-crate Shading Device. It is important to note that it is advisable that the devices be anchored with bolts or screwed to the building to prevent thermal bridging. **Ventilation:** In the tropics, ventilation of the room should always be crossed. Considerable efforts should be made to avoid the use of one sided windows.

3. DESIGN CONSIDERATION

The human race is affected by factors such as lighting, heat (temperature), ventilation, sound, etc. Therefore design consideration is to enunciate the steps that should be taken to improve the individual effect of those factors that impairs the efficiency of production in the Senate building. With architectural prudence, this should be an embodiment of the sensation of well-being so as to enhance the mental and physical activities that form the basic routine of work. It behoves on the designer to try as much as possible to design an appropriate habitation that turns an unpleasant environment into a pleasant one. This provides an index for the quality and overall success of the design project. Although these considerations apply to all projects in general terms, but for every specific project, the degree of importance attached to each consideration varies.



Lighting: Lighting is essential in any building for a good perception of space. Perception of space is as a result of reflected light by objects and walls surrounding the space. These objects and walls would not be able to reflect light if there is no source in the first place. The light being reflected could either be natural or artificial light.

- **Natural Lighting:** The sun is the only source of natural light in the universe. Due to the high intensity of the sun, it is usually hazy or sub-due depending on daytime and weather. These factors normally influence its intensity. Its penetration into interior spaces is dependent on the orientation, type, size and placement of openings and windows, and material used.

In order to enhance the penetration of daylight, various light openings are employed. Sky light could be used to constantly supply natural light during the day time into the building. Its upper placement makes it prone to direct day light penetration which is not obstructed by any element. They give more illumination on horizontal plane than light coming from the lower parts of the walls. However, the disadvantage of this window is that it encourages dust settlement and they are not easy to clean because of their height. This will eventually lead to poor illumination.

Natural light can also come into a building through the openings on the facades (Window openings). This can either exist at a low level or a high level window opening. The major disadvantage of window is that the illumination is not deep enough and this results in non-uniform illumination of the entire space.

- **Artificial Lighting:** Since it is a known fact that the natural lighting can only be made use of in the day, it becomes imperative that artificial lighting must be employed in buildings. Artificial lighting may be required for special purposes in places to avoid preservice. Examples are libraries and museums.

In a Senate Building, it can be used to create exotic ambience for places like reception area, lounges and entrances. In this case, they are used to give the user of a space a clear perception of the type of functions available in the space the user is entering.

The source of artificial lighting is by electric power. It can only be provided through enough lamp fittings in buildings these lamp fittings can be classified into two. They are incandescence and fluorescent lamp. The incandescent lamps are produced by heating a wire (usually tungsten) with electricity. These lamps have warm illumination with a rich proportion of yellow to red colour coves. The fluorescent lamps on the other hand are low pressure mercury discharge lamps, producing light through the action of "Fluorescence" (emission of light) of its coatings. They are good for illuminating reception areas, circulation spaces and stair halls because they cast little or no shadow.

It is important to note that a proper combination of Natural and Artificial lighting can be used to produce a good illumination to a space.

Fire Safety: Fire safety deals with the prevention of fire occurrence and protection of its occupants, building contents and structure of the building from risk associated with fire out-break.

In a Senate building, fire is prone to occur due to negligence and carelessness on the part of the workers and users. Possible sources of fire outbreaks may include:

- Electrical Faults
- Unextinguished flames
- Kitchenette
- Force Majeure

Fire prevention can be achieved with the use of two methods. These are the passive and active methods. With regards to passive method, fire protection is achieved through building planning layout, access and construction. It aims at providing fire escape routes in the event of an outbreak. The active method involves the use of manual or automatic directed intervention in the case of fire outbreak. It is based on the installation of the following; Smoke detectors, drenchers, sprinklers and fire-fighting equipment.

- Smoke detectors and fire alarms work by responding to rapid increase in the room temperature or smoke detection in that space. Smoke detectors are used as active means for fire protection and they should be installed in areas of high fire risks.



- Alarm systems are triggered to alert occupants in an event of outbreak of fire. This gives them time to escape the building.
- Sprinklers are fire-fighting equipment, sensitive to fire outbreak. The sharp temperature change triggers the bulb in them causing them to shower high pressured water on the area affected by the outbreak.

Climatology: In a Senate building, both the internal and external environment, to a large extent, determine the degree of satisfaction its users desire from the facility. Facilities and activities are therefore needed to be placed with proper orientation so that maximum benefit is derived from the warm humid tropical climate the user craves for. It is in this process that the placement of the building on the site takes best advantage of its micro climate.

Thermal Insulation: Exchange of heat between two bodies of different temperature results in their possessing the same temperature at some intermediate value between their origin temperatures over a given period of time. When the external environment is of higher temperature than the internal, the internal room temperature soon rises until the internal and external temperatures are of the same values.

Heat is transferred through the following:

- Convection: In convection, warm air rises while cool air falls. The cool air gets heated and the process continues till the temperature of the room is equivalent to the source of heat. In offices, little heat energy is generated.
- Conduction: Heat is transferred by conduction on the fact that solid bodies, liquids and gasses are made of molecules which transfer heat energy by contact between these molecules.
- The thermal conductivity of construction materials in buildings forms an important criterion in determining the heat insulating capacity of the materials.
- Radiation: This is the transfer of heat between two bodies through a vacuum.

Hence, the followings will be recommended for controlling heat flow into the building in this design.

- Adopting good construction techniques; use of sun shading devices, deep roof eaves and over hangs.
- Insulating the walls and roof
- Landscaping the environment with soft absorptive elements such as trees, plants and others.
- Using reflective materials on external surfaces.

Utilities: Like all other campus buildings, the Senate building needs the supply of utilities to function effectively. There must be efficient and sustainable provision of water, electricity, telephone, radio and internet services. Water supply for the building should be from the campus central water treatment plant. Provisions should however be made to provide an independent water treatment plant if the campus does not have a central plant. Electricity would be supplied from the university power station. The use of solar panels and battery inverters should be employed to power light electrical equipment and the lifts.

Circulation and Zoning: Appropriate and well-articulated pattern of circulation in a building alleviates confusion and at the same time tailor the movement of workers and visitors to their respective destination. This ensures security of life and property. Hence, enhance their level of productivity and efficiency. This aspect will be resolved in relation to the anticipated flow of traffic in the site as could be deduced from the university master plan. For clarity, the functions of this building will be grouped into public zone, semi-public and private zones.

Disabled Consideration: In our society, disabled have shown considerable interest in acquiring higher education. This is evident with the growing percentage of disabled students and those aspiring to be students in our various universities. Hence, the disabled are expected to make use of the Senate building. However, the natures of disability to be accommodated in this design proposal are:



- Visual disability: Ramps should be gentle in slope in the area used, staircases must be of low risers, wide threads and the riser/thread proportions should be uniform throughout the building. Circulation paths should be clear and unobstructed by any physical barriers, especially where access to a space is possible for the public.
- Physical disability: Change in levels may be accompanied by the provision of ramps. Circulation path must be wide enough to accommodate the movement of a wheel chair.

Parking: The parking area shall depend on the location of the building, access into the site, and type of facilities to be provided for in the building.

A good parking should take note of the existing parking culture of the environment and avoid conflict between the pedestrian and vehicular access into the building.

Spatial Requirements

Facilities to be provided in the proposed Senate Building shall include the following:

- Offices
- Senate Chamber
- Council Chamber
- Meeting Facilities
- Public Spaces
- Parking Spaces
- Sanitary Spaces
- Storage Spaces

Design Philosophy

The design philosophy can be said to be a set of postures or values which the architect relies upon for synthesising form in the design process. Whether articulated or not, these design views the architect possess has a great influence on his design. His design objectives are governed by these values. However, no rule exist as to what design philosophy or what a project should be. For most projects, it is a function of the architect's idiosyncrasies. It could be the client, the context of the project area, or the users of the facility to be provided. As mentioned earlier, the Senate building would serve as a character for the university. It seats the two most powerful bodies (Senate and Council) in the institution. Its philosophy is guided by the context of the institution to be provided for. In the design of the Senate Building for Caleb University, the philosophy guiding the architect is the Caleb architecture. The Caleb architecture has to do with the following:

- Doric Columns,
- Horizontal Stacking,
- Clear Span of Spaces,
- Landscaping, and
- Parking.

Doric Columns: The Caleb environment has employed the use of Doric columns on the facade most of its structures. It has also employed the use of these types of columns at the entrance of the structure.



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University of Ghana, Legon, October, 2017,



Doric Columns Featured on Caleb Site

Horizontal Stacking: This may be referred to as horizontal spread of building of its building. Most of its facilities are seen to spread along the horizon.



Horizontal Stacking Featured on Caleb Site

Clear Span of Spaces: The spaces in the Caleb environment possess an atmosphere of clear view without any obstruction.



Clear Span Featured on Caleb Site



Landscaping: Landscaping is an idea to enhance the serenity of the environment. It is one of the prominent features in its environment.



Landscaping Featured on Caleb Site

Parking: The idea of selected parking area was integrated into the designing of the master plan.



Parking Featured on Caleb Site



Concept

The concept idea for any design is the idea that binds together all other ideas in the cause of achieving specific goals in a design.

For the purpose of this project, the concept shall be oriented towards stacking. Stacking is the orderly piling of functions vertically or horizontally. Stacking of functions can exist both vertically and horizontally. Staking vertically only would make the building too tall and out of context, Stacking Horizontally only would make the building match the context of the environment but it would lack authority.

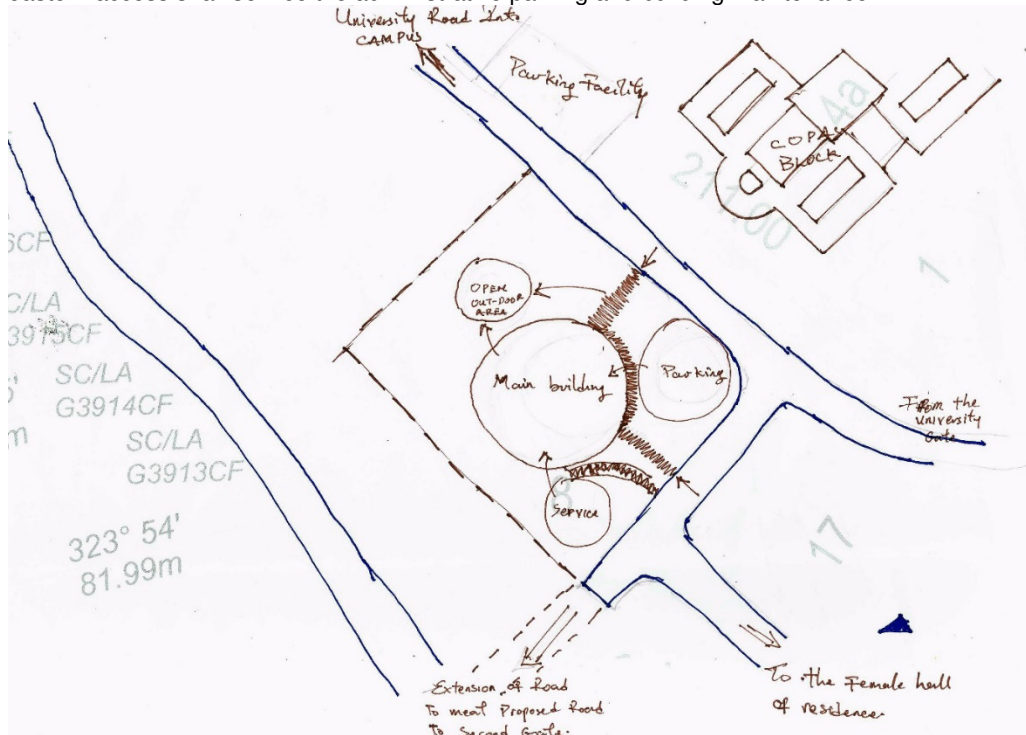
The design solution is to stack the functions both horizontally and vertically there by integrating in the design, the context of the current Caleb environment and also showing the hierarchy in the Authority.

Design Development

The design development shall be discussed under the following headings:

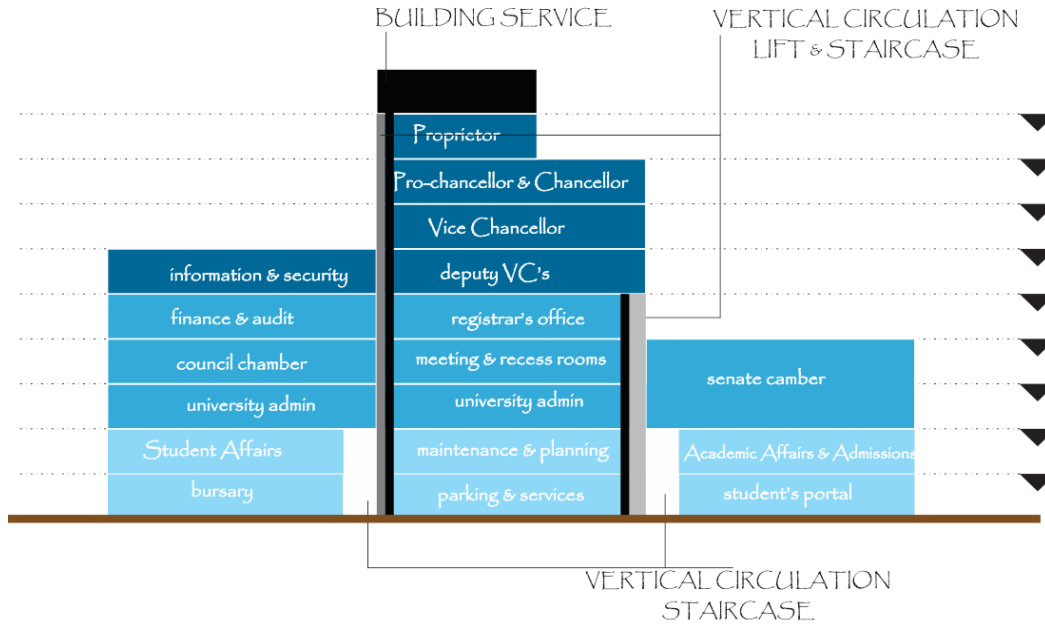
- o Overall concept layout
- o Functional Layout
- o Design Concept

Overall Concept Layout: The overall layout shows the external circulation in relation to the Senate Building. Access is taken from the access roads on the north east and south eastern part of the site. The North eastern access shall service the building and general parking, while the south eastern access shall service the administrative parking and building maintenance.



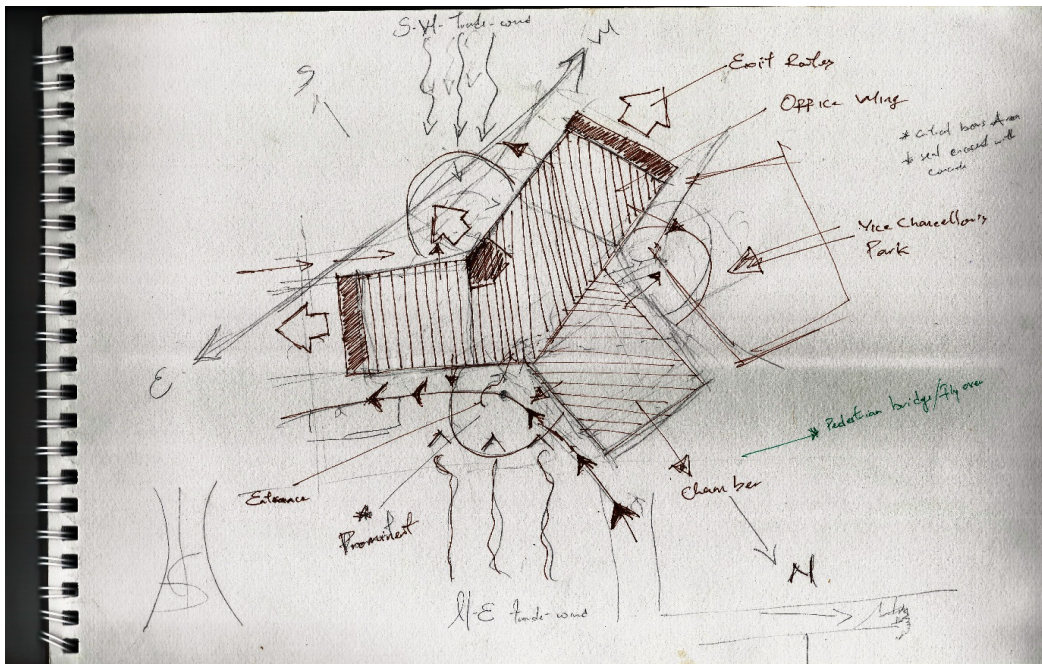
Overall Conceptual Planning

Functional Layout: This shows the overall functional layout of different activities proposed for a Senate building. Their locations and relationship with other facilities.



Functional Layout

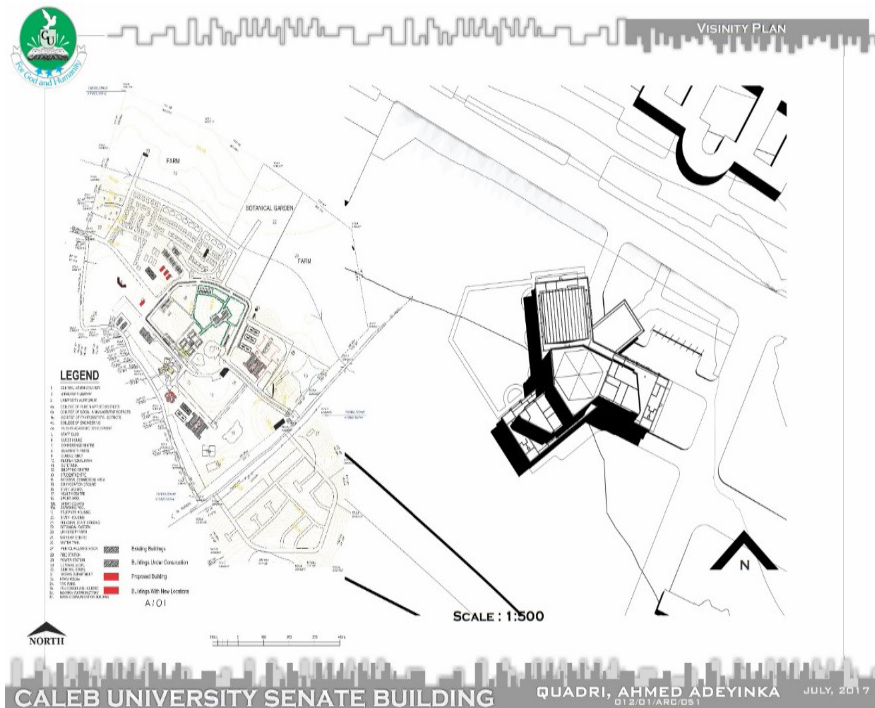
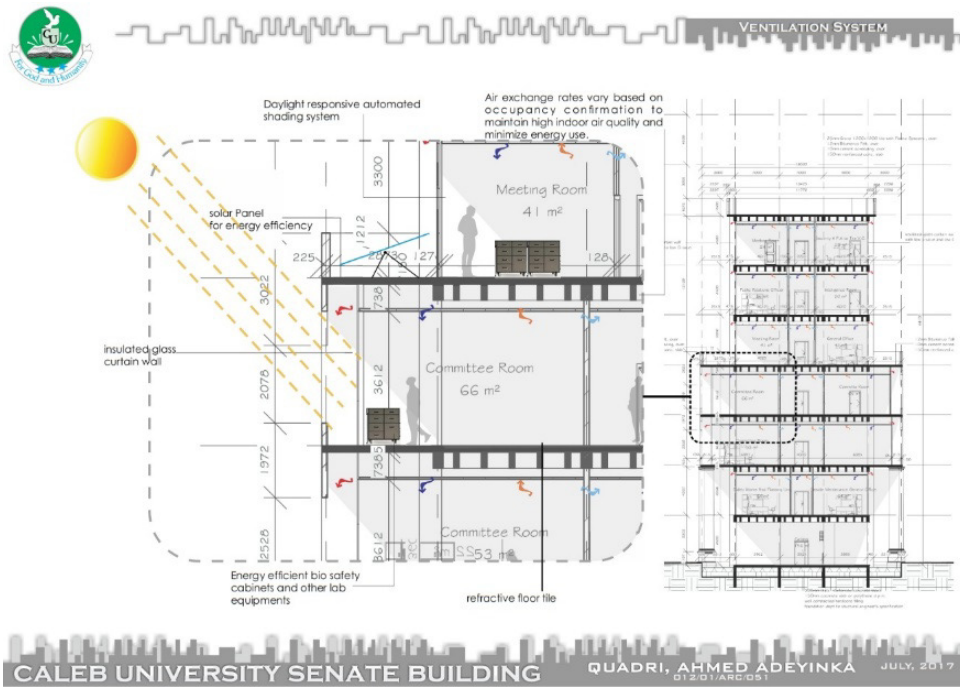
Design Concept: This shows the general idea guiding the design. The idea of stacking horizontally and vertically. Stacking can be used to interpret relationship between functions on the same level and functions between levels. In achieving the goal of the design, the concept of sustainability was also integrated in the concept process by orienting the offices to face the south side and service facilities run on the east and west ends.

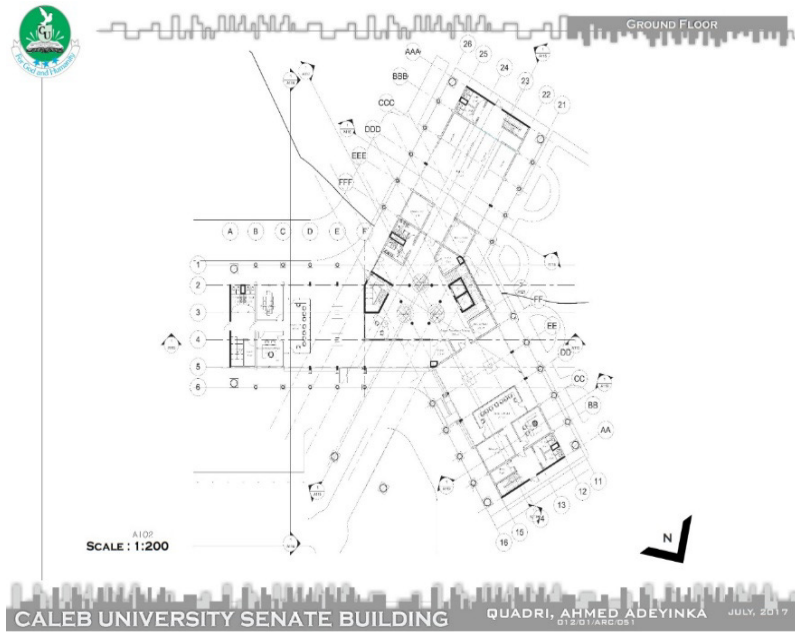
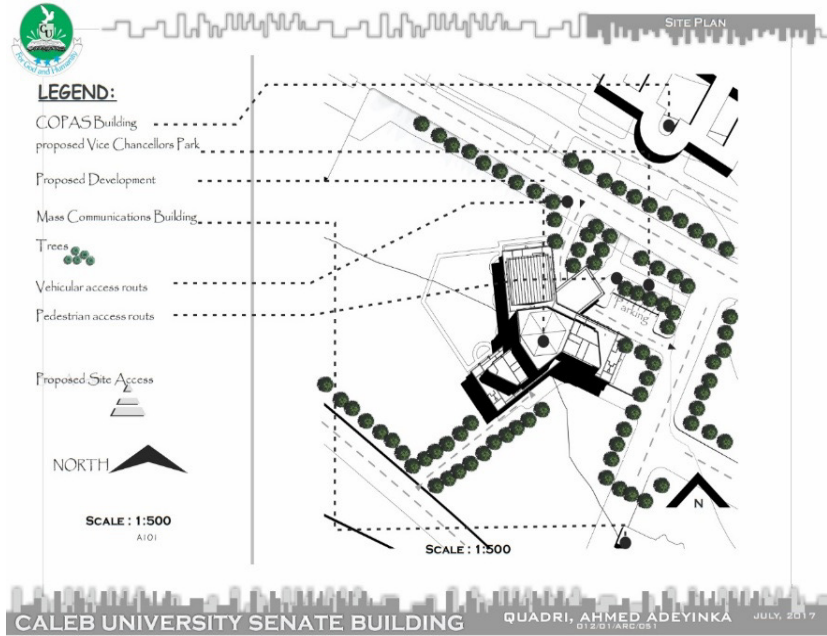


Design Concept



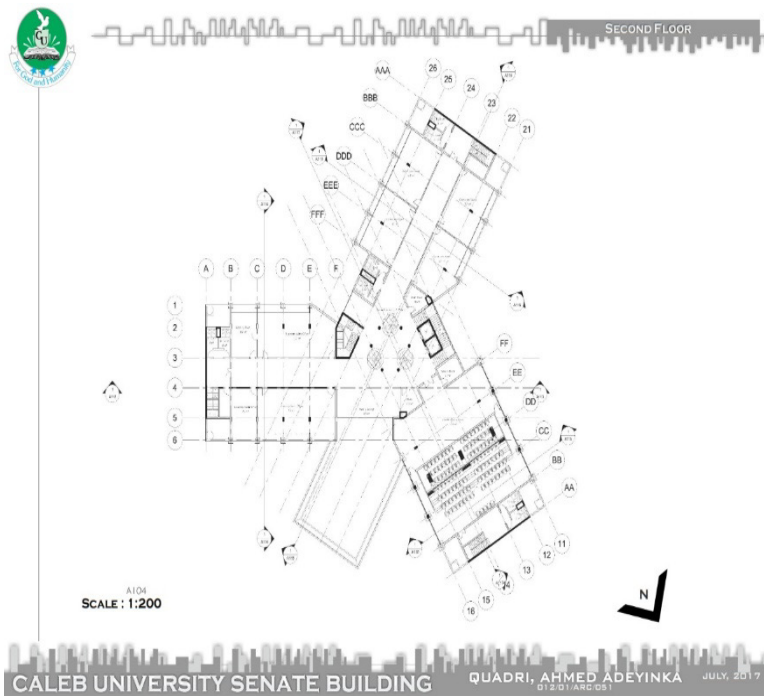
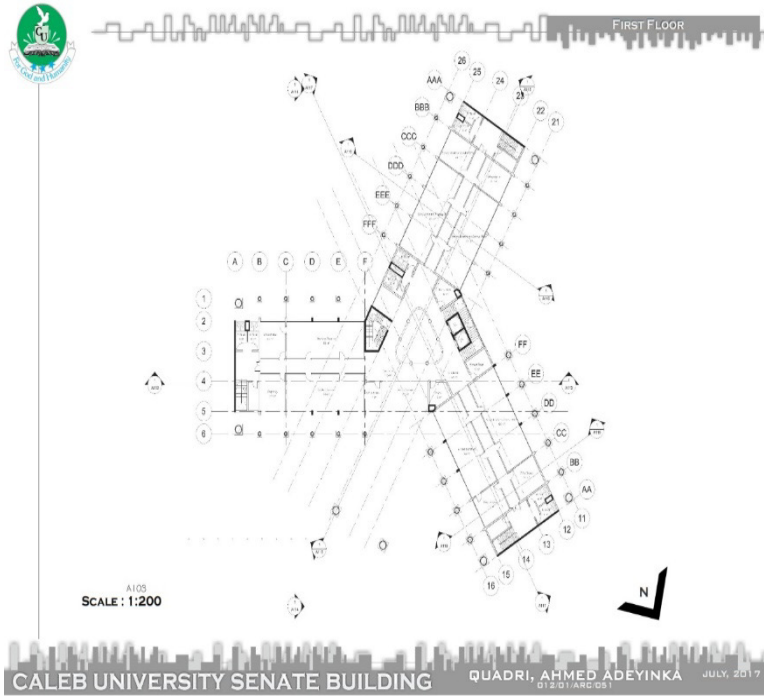
4. PRESENTATION AND APPRAISALS





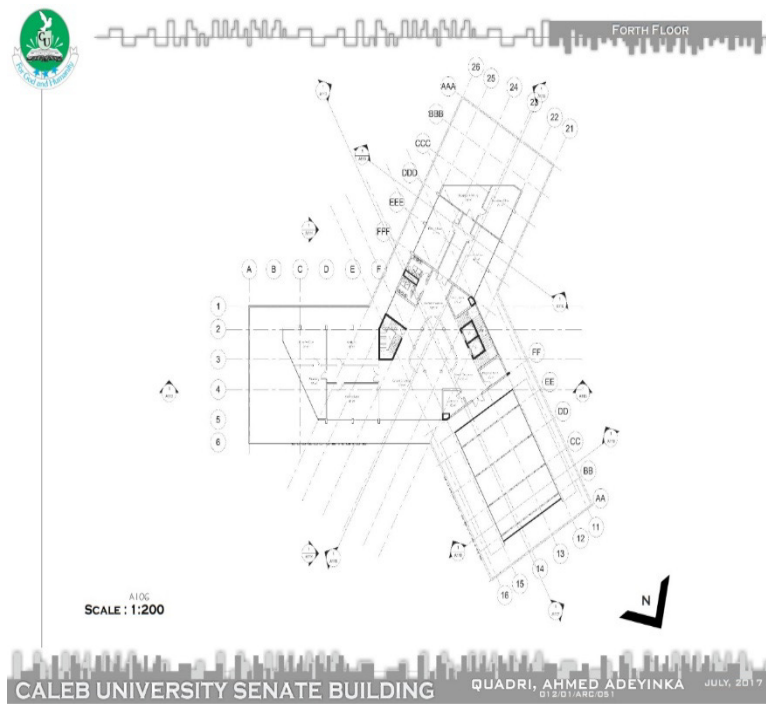
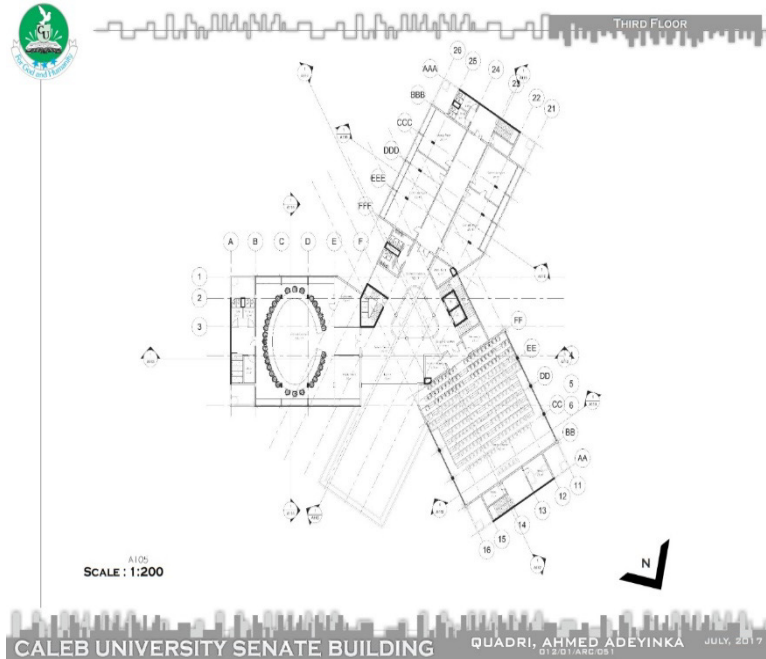


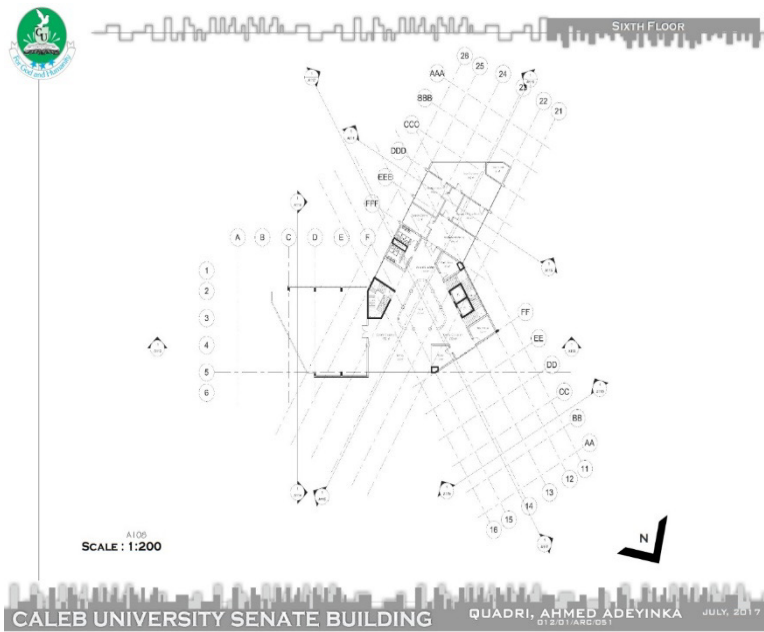
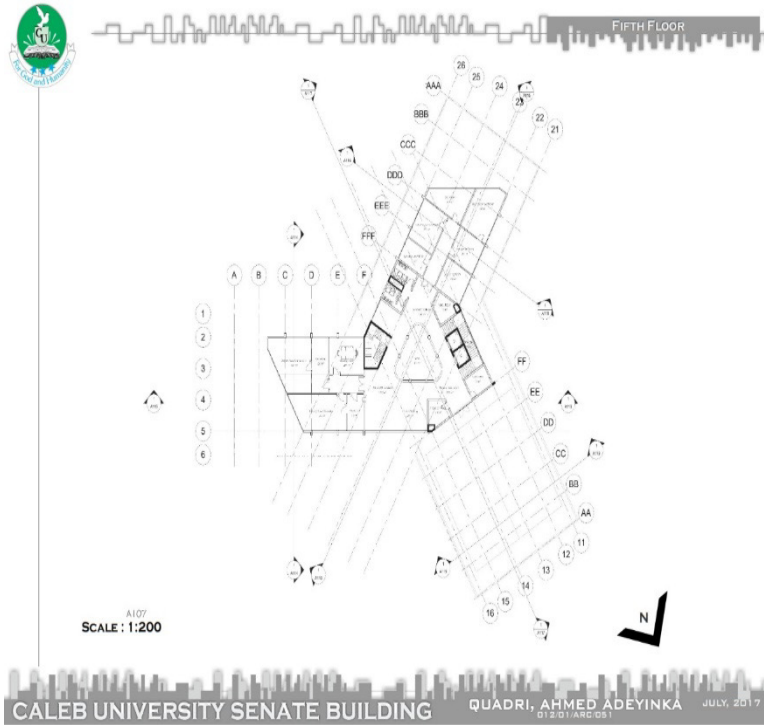
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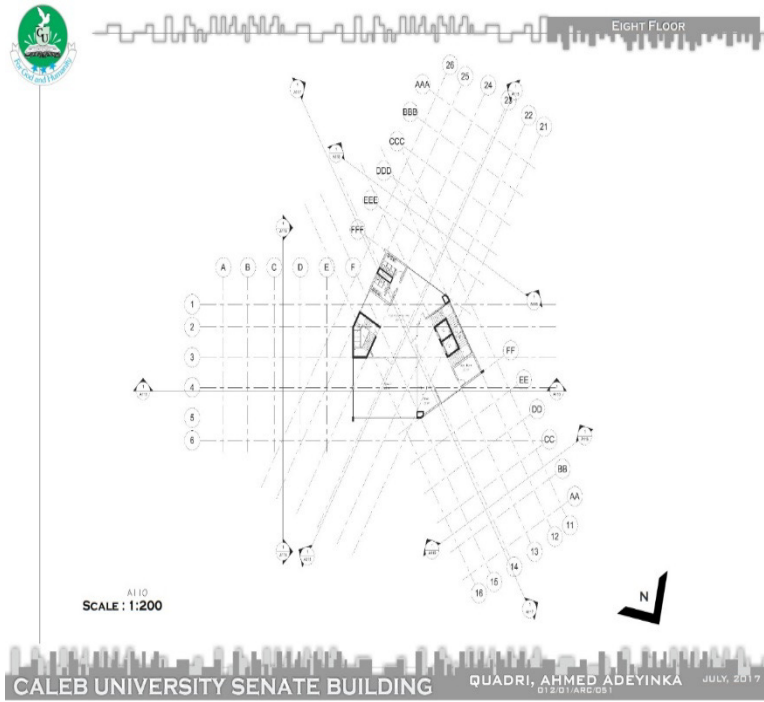
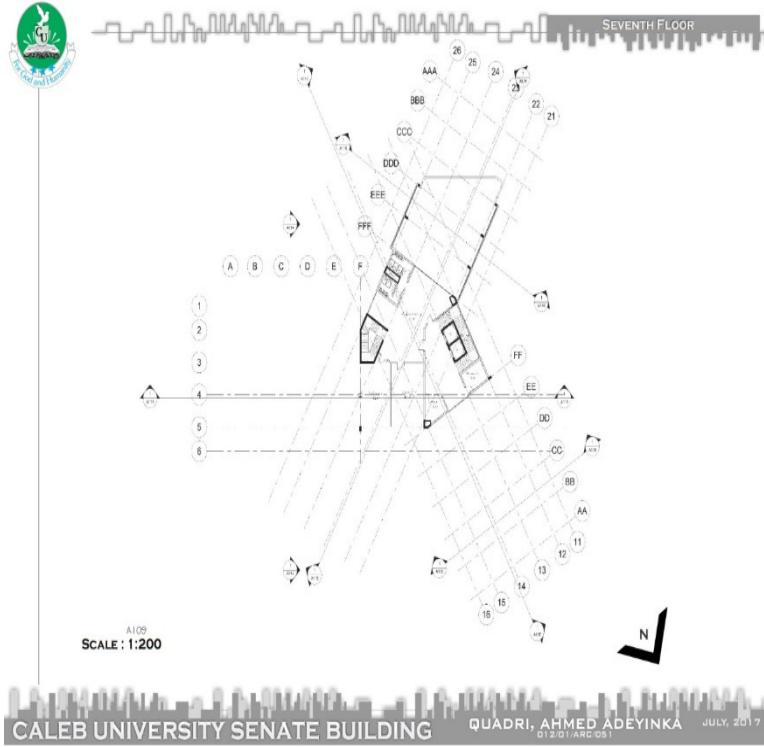


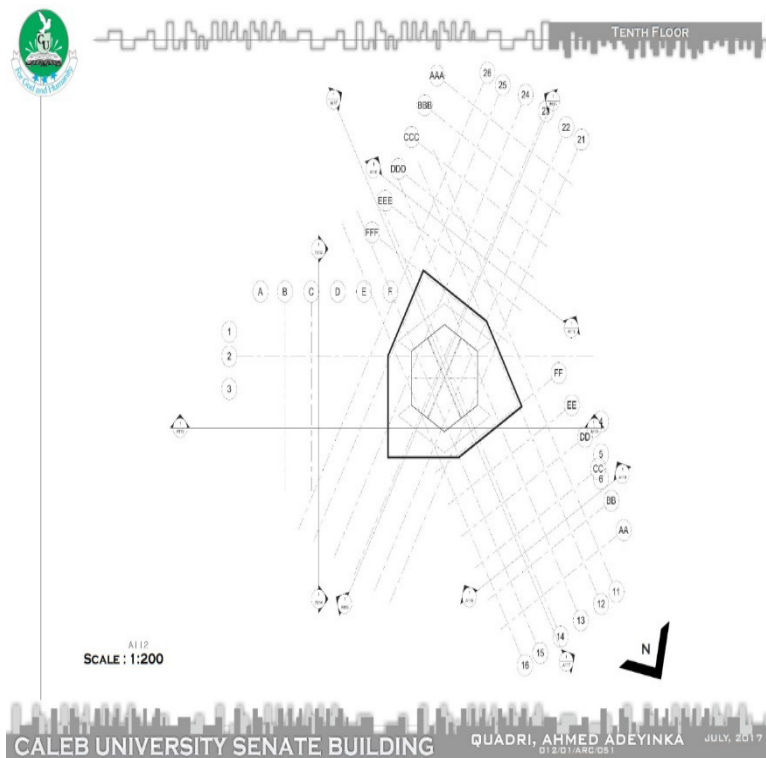
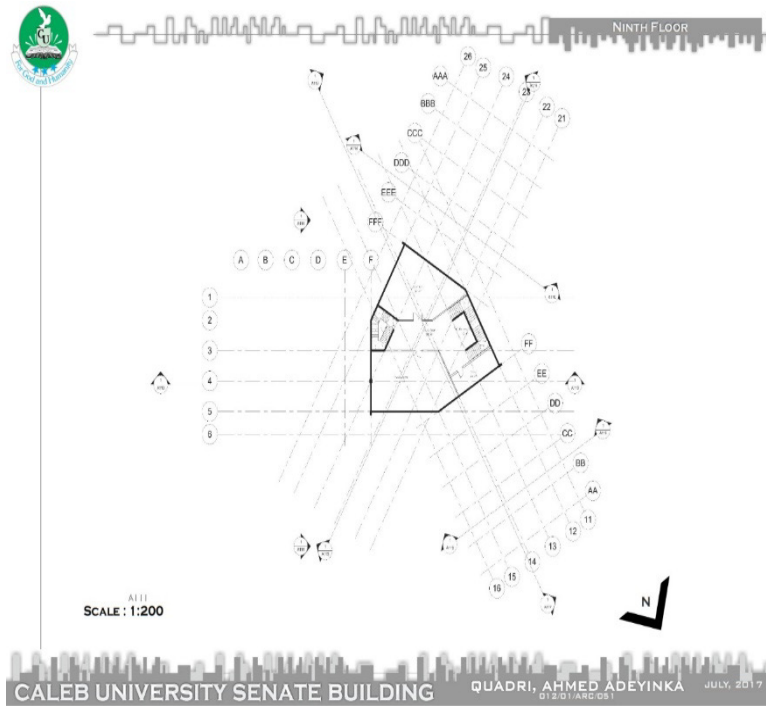


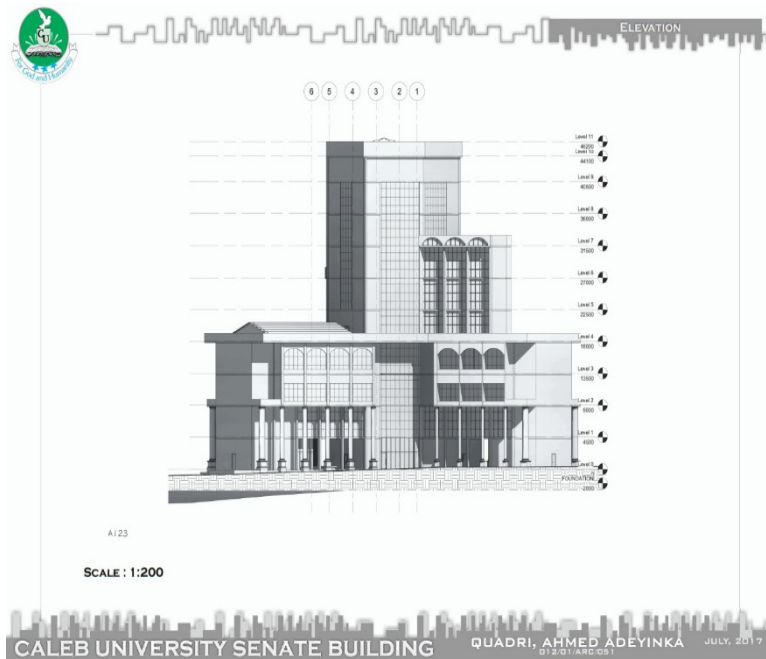
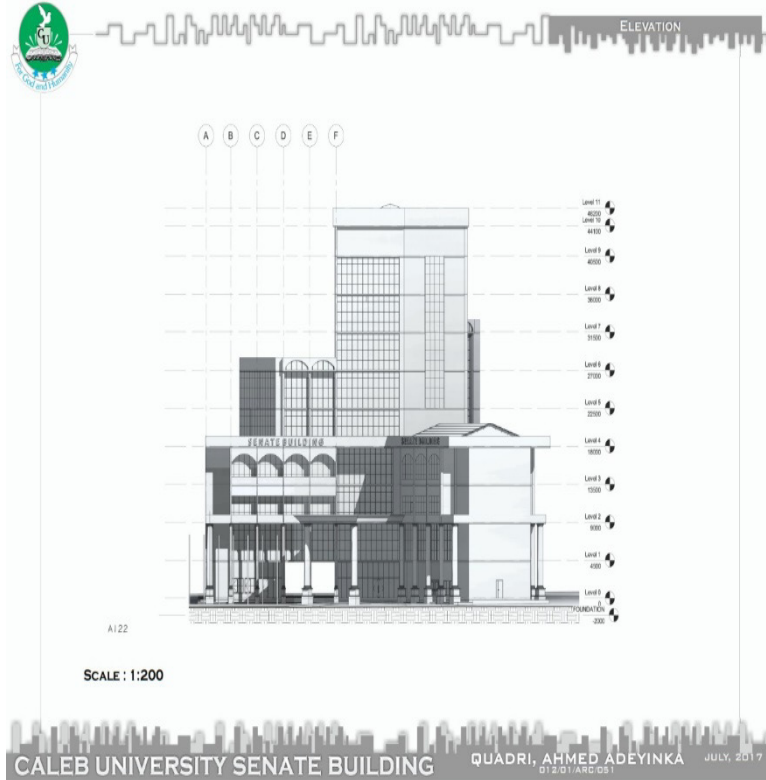
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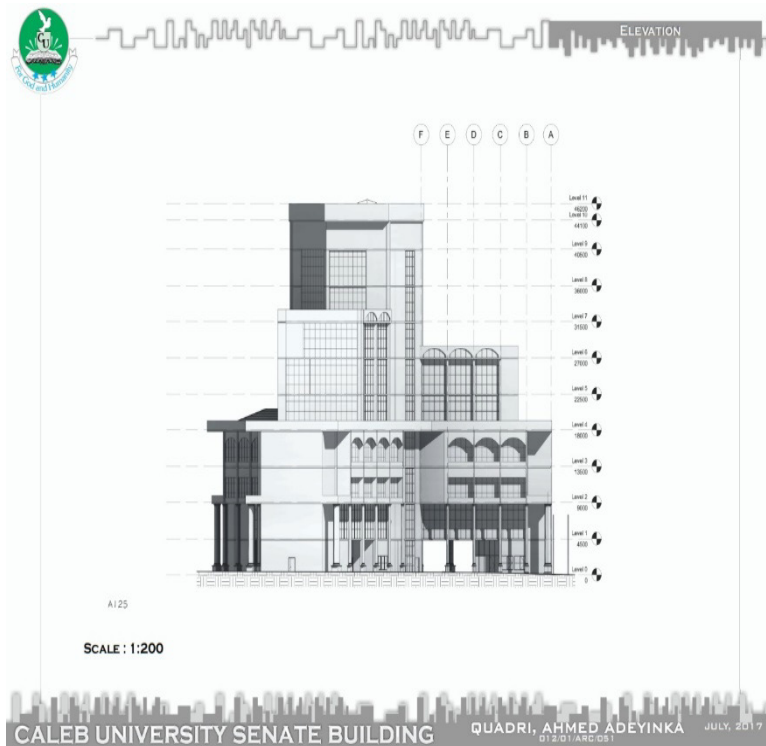
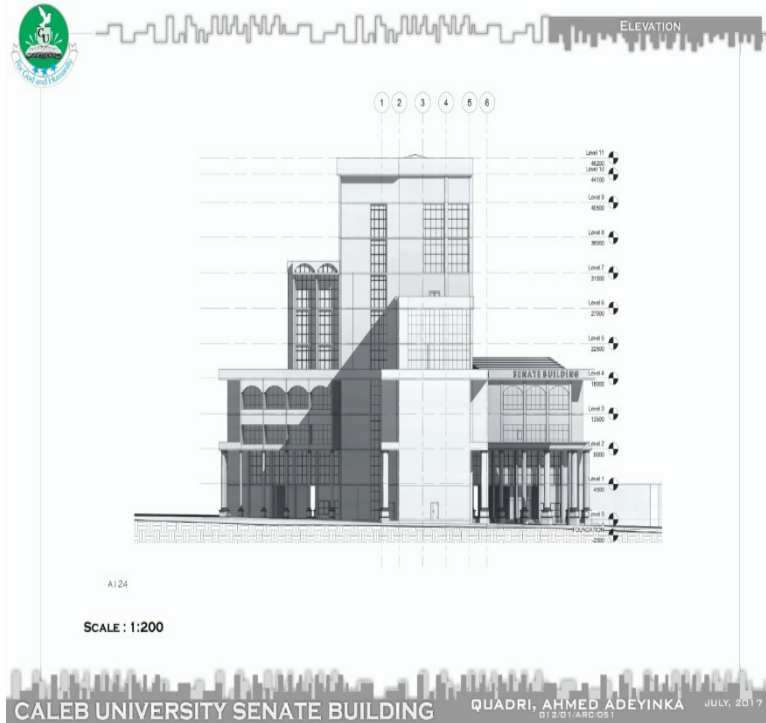














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PERSPECTIVES



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PERSPECTIVES



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5. CONCLUSION

Sustainable design solutions are the way out to create balance in the earth's ecological system. These design solutions however should not be generalized for every geographical location. The idea of efficient office environment depends greatly on how the architect responds to the climatic and environmental problems associated with that geographical region with the intent to improve and preserve it for the unborn generations. Once again, I appreciate you for inviting me to this conference and the opportunity to share my thought with this unique gathering. This presentation shall not be complete without your input I therefore look forward to learn from your comments, questions and possibly answers to questions.

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