

From Faith to Function: Passive Design Strategies for Enhancing Thermal Comfort in Religious Youth Camps

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Abstract- Religious youth camps in Nigeria play an important role in the spiritual growth, moral formation, and social development of young people. Despite their significance, many of these camps are poorly designed, with buildings that lack proper ventilation, shading, and orientation, leading to uncomfortable indoor conditions especially during hot and humid seasons. This study explores how passive design strategies can improve thermal comfort in Christian youth camps in Southwest Nigeria. Using a qualitative case study approach, three camps were examined through site visits, building assessments, and observations of environmental conditions. The findings show that simple measures such as aligning buildings with prevailing winds, creating shaded courtyards, using roof overhangs, and selecting local materials with good thermal properties can make indoor spaces noticeably cooler and more comfortable. Camp participants reported feeling less fatigued and more engaged in worship, learning, and recreational activities in well-designed areas. The study highlights that passive design not only reduces reliance on electricity and generators but also supports better spiritual experiences. Recommendations are offered for architects, and policymakers of this religious youth camps to create youth camps that are both environmentally responsive and supportive of faith-based activities.

Keywords: Religious, Youth Camps, Passive Design, Strategies, Thermal Comfort, Sustainable Architecture, Camp

I. INTRODUCTION

Religious youth camps have become increasingly prominent in Nigeria as spaces where young people gather for spiritual growth, moral development, skill acquisition, and recreation. Organized by faith-based organizations across Christianity, Islam, and traditional religions, these camps provide temporary or permanent facilities that host large numbers of youths for retreats, teachings, leadership training, and community-building activities (Adebayo, 2019). Beyond their role as spiritual retreats, they function as

microcosms of community life, where young people engage in worship, education, recreation, and cultural exchange. In recent decades, the popularity of such camps particularly among Christian and Muslim groups has led to the proliferation of dedicated campgrounds across various regions of the country (Okonkwo & Okwu, 2020). Despite their social and spiritual importance, many of these camps suffer from poor architectural design and limited consideration of environmental sustainability. Facilities are often constructed without professional architectural input, resulting in overcrowded spaces, inadequate ventilation, excessive dependence on artificial lighting, and inefficient energy use (Akande, 2010; Babalola, Ibem, & Ezema, 2019). These shortcomings are particularly concerning given the unreliable electricity and water infrastructure in many camp locations. While global discourse increasingly emphasizes the relationship between humans and the environment and the need for sustainable development, the architectural quality of Nigerian religious youth camps especially in terms of environmental responsiveness and passive design strategies remains underexplored (Babalola et al., 2019).

Thermal comfort is a critical determinant of user experience within built environments. According to Fanger's (1970) seminal model and subsequent adaptive comfort studies (de Dear & Brager, 1998; Nicol & Humphreys, 2010), occupants' productivity, well-being, and satisfaction are closely tied to how comfortable they feel in relation to the thermal environment. For youth camps, which involve physically engaging activities such as sports, group discussions, and worship sessions, thermal discomfort can diminish the quality of participation and reduce the effectiveness of intended programs. In Nigeria's hot-humid climatic context, characterized by high solar radiation, seasonal rainfall, and elevated

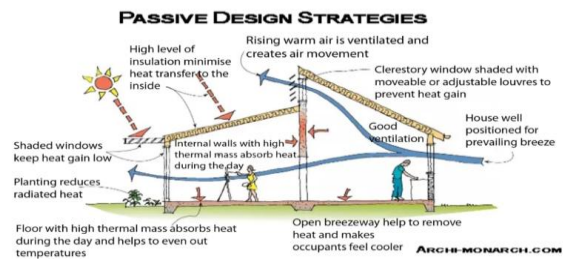
humidity levels, ensuring acceptable thermal comfort is both a design and sustainability challenge (Ogunbodede, 2015). Despite the centrality of comfort in shaping camp experiences, the architectural design of many Nigerian youth camps continues to prioritize functionality and scale over environmental performance. Buildings are often constructed with little regard for orientation, natural ventilation, material properties, or shading factors which significantly affect indoor climate regulation (Awotona, 1997). Reliance on mechanical cooling systems such as fans and air-conditioning units not only increases operational costs but also exacerbates energy consumption in a context already burdened by unstable power supply (Ajayi, 2014). Consequently, many camp facilities remain thermally inefficient, environmentally unsustainable, and financially demanding to operate.

Passive design strategies such as orientation, shading devices, natural ventilation, daylighting, use of thermal mass, and landscape integration have long been recognized as cost-effective and sustainable approaches to achieving thermal comfort (Olgay, 2015; Chandel et al., 2016). These strategies harness natural climatic resources while reducing dependence on artificial energy systems, aligning with global sustainability goals and traditional vernacular wisdom (Hyde, 2000). In Nigeria, where vernacular building traditions historically adapted to local climates through thick walls, deep eaves, courtyards, and cross ventilation, integrating passive design into contemporary youth camp architecture offers a culturally and environmentally grounded pathway to sustainability (Falola & Salami, 2021). The aim of this paper is to examine the role of passive design strategies in enhancing thermal comfort within religious youth camps in Nigeria. This study seeks to analyze the architectural challenges of existing youth camp facilities in relation to thermal performance, examine the applicability of passive design principles within hot-humid climates, and provide design-based recommendations for future youth camp developments that integrate faith-based functionality with environmental responsiveness.

Literature Review

Passive Design in Architecture

The definition of passive design encompasses strategies that aim to optimize a building's performance by using natural processes to maintain comfort and minimize energy use. These strategies include the strategic placement of windows and insulation, the use of thermal mass, and the design of natural ventilation systems (Berardi, 2021, Gong, et al. 2021, Jenkins, Taylor & Davis, 2021, Li, et al. 2021). According to authors Passive design maximizes the use of "natural" sources of heating, cooling and ventilation to create comfortable conditions inside buildings. The design that maintains a comfortable temperature within the building using the climate and natural elements to get the optimum benefit and to reduce or eliminate the independence on mechanical systems for heating, cooling and lighting, is called 'Passive Design'. There are two crucial measures that should be considered for passive design to be beneficial and effective: climate and comfort.



Passive design is about taking advantage of natural energy flows to maintain sustainability. It is about using the appropriate building orientation, building materials and landscaping. The buildings should be properly oriented and the fabric of the building envelope should be specified to prevent or minimize heat gain. Shading also should be provided to minimize solar radiation (Agboola 2011). Passive design strategies like solar shading and natural ventilation can reduce cooling energy and attain a good daylight environment in hot and humid regions (Chen et al., 2021). These techniques and strategies can also be supported by various parameters such as using technologies (passive and/or active) and customisable controls as well as enhanced by patterns of biophilic design for improving health and well-being in the built environment. Passive ventilation strategies, such as night ventilation through window

openings, can effectively reduce indoor CO₂ concentration in buildings, ensuring high indoor environmental quality and preventing overheating risks (Cakyova et al., 2021). When designing a home, the building envelope act as a barrier between natural climate and virtual climate to meet the human comfort level. Some of the major factor, which governs human comfort, is visual, thermal and acoustical comfort. Passive design is an architectural approach that optimizes natural environmental conditions such as sunlight, wind, and thermal mass to enhance indoor comfort while minimizing the need for mechanical heating, cooling, and lighting systems. It focuses on building orientation, ventilation, insulation, shading, and material selection to create structures that respond effectively to climatic conditions (Olgyay, 2015).

Unlike active systems, which depend on electricity-powered air conditioning and artificial lighting, passive design harnesses natural forces to regulate temperature and improve indoor air quality. It is widely used in hot-humid, hot-arid, and temperate climates, demonstrating its adaptability across different environmental contexts (Givoni, 1994). Internationally, passive design has become a cornerstone of sustainable building practices due to increasing energy demand, rising carbon emissions, and climate change concerns.. Regions with extreme climates such as Europe, North America, and the Middle East have widely adopted advanced passive techniques including double-skin facades, thermal chimneys, and adaptive shading devices. However, the direct transfer of global passive design strategies to Nigeria, requires critical adaptation. Nigeria's hot-humid climate presents challenges such as high humidity, intense solar radiation, and limited nighttime cooling, which demand context-specific approaches (Akande, 2010). While large glazed facades and thermal mass walls may perform effectively in temperate regions, they often underperform in tropical settings where strategies such as cross ventilation, shaded verandas, light-colored reflective surfaces, and the integration of vegetation are more effective. socio-economic conditions such as limited access to advanced building technologies, high construction costs, and reliance on informal materials underscore the need for contextually sensitive passive design solutions that balance affordability with environmental performance.

Importance of Passive Design in Architecture

Passive design is a fundamental strategy in contemporary architecture, particularly in hot-humid regions where climate change, rising energy costs, and environmental degradation intensify building performance challenges. Effective techniques such as triple glazing, optimized window orientation, shading devices, and natural ventilation scheduling have been shown to significantly improve indoor conditions (Rana, 2021). Beyond aesthetics, passive design enhances comfort, reduces energy use, and ensures cost-effective building performance by considering site layout, envelope design, and material selection (Ma et al., 2022). Its relevance extends to residential, commercial, and religious buildings, where comfort, efficiency, and sustainability are critical. Religious youth camps, often located in semi-rural environments with limited infrastructure, stand to benefit greatly from these strategies through improved functionality, self-sufficiency, and reduced operational costs.

i. Enhancing Indoor Comfort

Passive design regulates temperature, humidity, and airflow without heavy reliance on air-conditioning. In Nigeria's hot-humid climate, poor ventilation often causes heat stress and fatigue, especially in crowded spaces (Adebayo, 2016). Studies show passive strategies can maintain indoor conditions up to 5–7°C cooler than outdoor levels, reducing discomfort and heat-related risks (Zain-Ahmed et al., 2019). For youth camps, features such as cross-ventilation, shaded courtyards, and appropriate orientation support worship, learning, and recreation in healthier, stress-free environments.

ii. Reducing Energy Consumption

Globally, buildings account for about 40% of energy use (IEA, 2020). In hot-humid regions, cooling systems consume over 60% of electricity in religious and institutional buildings. Passive design can reduce energy demand by 30–50% (Hyde, 2000; Ajayi & Adebayo, 2023). For Nigerian camps, where power supply is unreliable and generator costs are high (Olotuah & Adesiji, 2015), strategies like solar shading and natural ventilation are essential for energy resilience. Case studies confirm tropical buildings using passive design consume 30% less cooling energy than conventional designs (Nguyen et al., 2012).

iii. Promoting Cost-Effective Construction and Maintenance

Passive buildings require fewer mechanical systems, lowering both construction and operational costs. Reduced reliance on HVAC translates to lower energy bills and less maintenance (Nguyen et al., 2012). For camps with limited funding, passive strategies provide durable, low-cost solutions while ensuring long-term functionality.

iv. Supporting Environmental Sustainability

The construction sector contributes 36% of global CO₂ emissions (UNEP, 2019). Passive design reduces dependence on energy-intensive systems, lowers embodied carbon, and supports resource efficiency. For religious youth camps often set in natural landscapes these strategies not only minimize ecological footprints but also reflect values of stewardship and care for creation. Camps integrating rainwater harvesting, green roofs, and natural cooling can serve as models of ecological responsibility within faith communities.

Thermal Comfort in Hot-Humid Climates

Comfort has been defined as 'the condition of mind which expresses satisfaction with the environment'. The indoor environment should be designed and controlled so that occupants' comfort and health are assured (CIBSE, Guide A, (1999)). Thermal comfort can be defined as "that condition of mind which expresses satisfaction with the thermal environment" by ISO(2005), whereby the thermal environment is measured by "thermal sensation" According to ASHRAE (2017) Thermal comfort refers to the state of mind in which an individual expresses satisfaction with the surrounding thermal environment (ASHRAE, 2017). It is not merely a physical condition but a psychological response shaped by the interplay of environmental, physiological, and behavioral factors. In architecture, thermal comfort is a key performance indicator for evaluating the effectiveness of building design in providing a habitable, health-promoting, and energy-efficient indoor environment. In hot-humid climates such as those prevalent in much of Nigeria, achieving thermal comfort is particularly challenging due to persistently high temperatures, elevated relative humidity, and limited diurnal temperature variation (Olaniyan & Olayemi, 2021).

Key Factors Influencing Thermal Comfort

- i. Air Movement: Adequate airflow is critical in hot-humid climates, as it enhances evaporative cooling and helps occupants feel cooler at higher temperatures. Natural ventilation strategies such as cross-ventilation and stack effect are often emphasized in passive design (Givoni, 1998).
- ii. Air Temperature: The perception of comfort is heavily influenced by ambient air temperature. In hot-humid zones, even slight temperature increases above 28–30°C can significantly reduce comfort levels unless compensated by increased air movement or reduced radiant heat
- iii. Humidity: Relative humidity plays a pivotal role in determining comfort. High humidity reduces the body's capacity for evaporative cooling, leading to heat stress and discomfort. This is a dominant concern in tropical regions where average relative humidity often exceeds 70%
- iv. Radiant Heat: Radiant heat from building surfaces, roofing materials, and direct solar gains significantly impacts perceived comfort. Passive design strategies such as shading devices, reflective roofing, and vegetation help mitigate this effect
- v. Clothing: The insulation value of clothing affects heat exchange between the body and its surroundings. In youth camp settings, clothing choices are often influenced by cultural and religious norms, which may limit adaptive opportunities
- vi. Activity Level: Physical activity generates metabolic heat, influencing comfort thresholds. Youth camp activities such as sports, worship, and group events often involve vigorous movement, thereby increasing the need for design solutions that enhance cooling and ventilation (Szokolay, 2008).

Relevance to Youth Camps in Hot-Humid Climates

Thermal comfort is highly relevant to users of religious youth camps, as it directly influences health, well-being, and productivity. Poorly designed camp facilities with inadequate ventilation and thermal regulation expose occupants to risks of dehydration, fatigue, and reduced concentration during religious or educational programs. Beyond health, thermally comfortable spaces encourage social interaction, spiritual engagement, and recreational participation,

all of which are central to camp life (Okonkwo & Okwu, 2020). From a sustainability perspective, achieving thermal comfort through passive design reduces reliance on mechanical cooling systems such as fans and air conditioning. This not only lowers energy consumption and operational costs but also contributes to environmental stewardship aligning with faith-based values of responsible resource management (Hyde, 2000). In addition, energy-efficient designs support broader climate change mitigation goals, particularly in regions where power supply is unstable and costly.

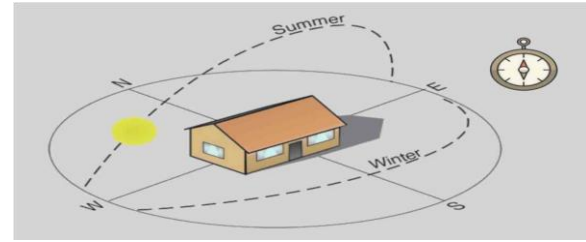
Passive Design Strategies for Thermal Comfort

Passive design strategies are fundamental in achieving thermal comfort, particularly in hot-humid climates where energy-intensive mechanical systems are neither environmentally sustainable nor economically feasible for continuous use. These strategies involve thoughtful planning of building form, layout, and material selection to naturally regulate indoor environmental conditions. The following sections outline critical strategies and their applications in architectural practice.

1. Building Orientation and Layout

According to Erebor et al., (2021), it has been recognized that proper building orientation on site is a crucial strategy for reducing heat gains within a building. Buildings should be planned in such a way that benefit is obtained from shaded indoor and outdoor living areas when the weather is hot and sunny indoor and outdoor areas with wind protection when the weather is cold. Building block orientation governs the passive technologies implementation within the design. The orientation and layout of a building are primary determinants of how effectively it interacts with natural climatic elements. Proper orientation maximizes exposure to prevailing breezes while minimizing heat gain from direct solar radiation. In hot-humid regions, elongated building forms with narrow floor plans encourage cross-ventilation, while positioning openings along the direction of prevailing winds enhances natural cooling. Layout design must also consider spatial zoning, with high-activity areas such as sleeping quarters or multipurpose halls located in cooler, shaded zones, while service areas may be placed on the warmer side of the building to buffer

interior spaces from heat gain (Givoni, 1994; Szokolay, 2014).



2. Natural Ventilation

Natural ventilation is essential for heat dissipation and maintaining indoor air quality. Two main techniques are employed: cross-ventilation and stack effect. Cross-ventilation involves strategically positioning openings on opposite sides of rooms to create pressure differentials that facilitate airflow. The stack effect, on the other hand, utilizes the principle that warm air rises, allowing hot air to escape through higher-level openings while drawing in cooler air from lower openings (Olgyay, 2015). Adequate ventilation not only cools interior spaces but also helps in controlling humidity levels, a critical aspect of thermal comfort in hot-humid zones.

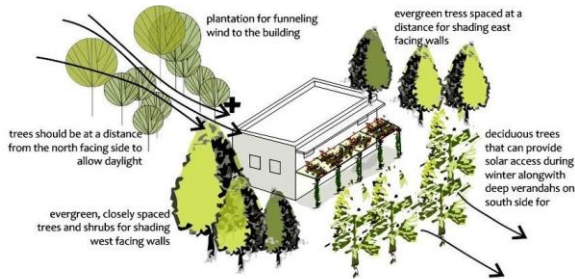
3. Shading

Shading significantly reduces heat gain by blocking direct solar radiation before it penetrates building envelopes. Overhangs, verandahs, louvers, pergolas, and vegetation can all be integrated into the design to provide shade for walls, windows, and outdoor activity areas. In addition to fixed shading devices, adjustable systems such as operable shutters or movable screens offer flexibility based on seasonal or daily variations in solar angles (Hyde, 2013). Proper shading reduces the cooling load on buildings and enhances the usability of outdoor spaces by creating comfortable microclimates.

4. Landscape Integration

Integrating landscaping into architectural design serves as both a functional and aesthetic strategy for achieving thermal comfort. Vegetation provides shade, cools the surrounding air through evapotranspiration, and acts as a buffer against heat radiation from paved surfaces. Courtyards, green belts, and tree-lined pathways are effective in moderating microclimatic conditions while reinforcing a sense of

connection to nature. Furthermore, landscaping can direct prevailing winds toward living areas, enhancing natural ventilation and cooling efficiency (Brown & DeKay, 2014).



5. Building Envelope Design

The building envelope including the roof, walls, and openings plays a critical role in controlling heat flow. Roofs in hot-humid climates are often designed with reflective or light-colored materials to minimize heat absorption. Insulated or ventilated roof spaces can further reduce internal heat gain. Walls should incorporate thermal mass to slow down heat transfer, while openings must be designed with adequate shading and operability to optimize airflow without allowing excessive heat ingress (Lechner, 2015). The integration of energy-efficient glazing and shading devices around openings also contributes significantly to thermal comfort.

6. Material Selection

Material choice influences thermal performance by affecting heat absorption, retention, and dissipation. In hot-humid climates, lightweight materials with low thermal mass, such as timber or bamboo, are preferred for walls and partitions to prevent heat storage. Roof coverings should have high reflectivity and low emissivity to reduce solar heat gain. The use of locally available materials not only supports sustainability but also ensures compatibility with traditional building practices and climatic conditions (Hyde, 2013). Moreover, finishes with reflective coatings or ventilated air cavities further enhance the thermal performance of the building envelope. Collectively, these strategies illustrate how passive design integrates environmental responsiveness with functional and aesthetic considerations, reducing dependence on mechanical cooling systems while promoting comfort, health, and sustainability.

2.3 Linking Faith and Functionality

The physical design of faith-based youth camps holds profound implications for spiritual engagement. Architecture is not merely a backdrop but a silent facilitator that shapes worship, reflection, and communal bonding. Environmental psychology studies show that features like thermal comfort, acoustics, lighting, and spatial clarity significantly impact focus, emotional well-being, and the overall quality of sacred experiences. When these environmental factors are neglected particularly in hot-humid environments participants may experience distraction, discomfort, and diminished spiritual openness.

For example, research in tropical places of worship demonstrates how passive design elements improve comfort and deep engagement. Vella et al. (2021) examined thermal comfort in Mediterranean worship spaces and found that optimized architectural systems using shade, airflow, and mass directly contributed to sustained spiritual attention and congregational satisfaction. Similarly, in hot-humid mosques in Malaysia, properly designed passive features like natural ventilation and shading reduced surface temperatures by 4–6 °C, improving occupant comfort during prayer by up to 40% effects that extend beyond physical ease to heightened spiritual presence. This reinforces the idea that when spiritual environments fail to account for comfort, they risk compromising both participation and deeper connection.

Spiritual formation in youth camps is deeply intertwined with functional design. When built environments prioritize thermal comfort and sensory ease, space becomes a conduit for spiritual enrichment. Conversely, discomfort can disrupt attention, silence, and emotional receptivity. Thus, integrating passive, climate-conscious architectural solutions is not only prudent but essential; it bridges faith with functionality, enabling architecture to uphold a camp's spiritual mission.

II. METHODOLOGY

Research Design

This study adopts a qualitative and analytical research design that integrates a comprehensive literature review with case study documentation. The qualitative

approach enables an in-depth understanding of passive design strategies applied in religious youth camps, focusing on how these strategies enhance thermal comfort in hot-humid climatic regions. The analytical component involves systematic evaluation of architectural features using thermal comfort indicators such as temperature regulation, airflow optimization, and shading effectiveness.

Case Study Selection

The study purposively selects three religious youth camps for detailed investigation:

- i. One international case renowned for its application of passive design principles.
- ii. Two Nigerian youth camps selected for their relevance to local climatic conditions, cultural context, and scale of operation.

Case Study 1: Camp Siloam, Siloam Springs, United States of America

Property Description

Camp Siloam is a purpose-built Christian youth camp located in Siloam Springs, Arkansas, United States. Established in 1923 and managed by the Arkansas Baptist State Convention, the camp spans over one hundred and fifty acres of wooded terrain. It provides a serene, secluded environment designed for spiritual growth, recreation, and communal bonding. The camp accommodates thousands of children and teenagers annually through structured programs that combine biblical teachings with nature-oriented and recreational activities. Facilities include worship centers, dormitories, recreational areas, dining halls, cabins, and administrative offices, all designed to support its mission of spiritual transformation in an immersive, distraction-free environment.

General Layout of the Camp

- i. Zoned Master Plan: Functional zones are organized into spiritual, residential, and recreational areas for effective spatial distribution.
- ii. Central Core: The main worship center (Tabernacle), dining hall, and multipurpose center form the camp's central hub, ensuring accessibility.
- iii. Accommodation Clusters: Dormitories and cabins are grouped around the central core at comfortable

walking distances, maintaining privacy and reducing noise.

- iv. Recreational Facilities: High-activity zones (e.g., courts, amphitheater, zipline area, and hiking trails) are placed at the periphery to avoid disturbing quiet areas.
- v. Landscape Integration: Buildings are embedded in the natural forested setting, preserving existing trees and using topography to shape circulation routes.
- vi. Circulation Strategy: Vehicular movement is restricted beyond the parking area, with pedestrian pathways promoting safety and social interaction.
- vii. Wayfinding: Landmarks such as the Tabernacle steeple, amphitheater, and outdoor crosses provide intuitive orientation for campers.
- viii. Support Facilities: Administrative offices, health centers, and maintenance areas are discreetly positioned on the camp's periphery.

Spatial Organization

The camp is divided into five functional zones:

- i. Accommodation Zone: Cabins with bunk beds, porches, and shared restrooms arranged to balance privacy with group living.
- ii. Spiritual Zone: A large indoor worship center accommodating over one thousand persons, complemented by an outdoor amphitheater for evening gatherings.
- iii. Dining and Fellowship Zone: A central dining hall with large windows for natural lighting and community-style seating.
- iv. Recreational Zone: Outdoor fields, basketball courts, a lake for canoeing, and adventure courses such as zip lines.
- v. Quiet Zones: Nature trails, prayer gardens, and secluded seating areas for reflection and meditation.

Passive Design Strategies

Orientation: Buildings are aligned along an east-west axis to maximize daylight while limiting direct solar heat gain.

- ii. Cross-Ventilation: Opposing window placements in cabins and halls facilitate airflow.
- iii. Natural Lighting: Large glazed openings and clerestory windows minimize artificial lighting needs.

- iv. Thermal Mass: Timber and stone construction materials help regulate internal temperature.
- v. Shading: Roof overhangs, verandas, and dense tree cover provide natural shading.
- vi. Material Choice: Locally sourced stone and timber reduce environmental impact while blending structures with the landscape.
- vii. Rainwater Harvesting: Roof slopes and gutter systems direct rainwater for irrigation and greywater use.
- viii. Landscape Preservation: Natural vegetation and tree canopies provide a microclimate that improves thermal comfort.

Merits

- i. Effective zoning reduces noise interference between functions.
- ii. Passive ventilation and daylighting significantly enhance thermal comfort.
- iii. Pedestrian-friendly design promotes safety and social interaction.
- iv. Multi-functional facilities accommodate diverse activities.
- v. Integration with nature enhances spiritual and recreational experiences.
- vi. Sustainable practices lower environmental impact.
- vii. Well-spaced accommodations offer privacy without isolating campers.
- viii. Communal spaces foster social cohesion and group participation.

Demerits

- i. Limited accessibility for mobility-impaired individuals due to terrain.
- ii. Noise from recreational areas can occasionally disrupt quiet zones.
- iii. Overcrowding may occur during peak seasons, stressing shared facilities.
- iv. Heavy weather dependence of outdoor activities limits year-round usability.
- v. Minimal technological amenities may reduce appeal for tech-oriented campers.
- vi. Insufficient indoor recreational facilities for adverse weather conditions.
- vii. Zonal separation may create a sense of fragmentation.
- viii. Limited expansion capacity due to ecological preservation efforts.

Deductions from the Case Study

- i. Decentralized spatial planning fosters both privacy and social engagement in youth camp settings.
- ii. Passive design strategies ventilation, orientation, daylighting, and shading are key to achieving thermal comfort in large-scale camps.
- iii. Integration of architecture with the natural environment enhances spiritual retreat experiences.
- iv. Locally sourced materials improve sustainability and create a sense of place.
- v. Clear functional zoning improves navigation and spatial efficiency.
- vi. Flexible and interactive spaces support youth-centered activities.
- vii. Accessibility, weather resilience, and future adaptability are vital considerations for long-term use.

Case Study 2: The RCCG Camp

Property Description

The RCCG Camp also called Redemption Camp or Redemption City is the international headquarters of the Redeemed Christian Church of God, located in Mowe, Ogun State, Nigeria. Established in 1983, the site has expanded dramatically and now spans over 2,500 hectares. It has evolved from a mere gathering space to a fully functioning township with over 5,000 residential houses, hospitals, schools, banks, supermarkets, a power plant, postal and recreational facilities.

General Layout of the Camp

- i. Urban-like Structure: The camp features built infrastructure common to cities including roads, power and waste management systems, security, residences, and commercial institutions, making it akin to a self-governing enclave.
- ii. Mega-Auditorium: Serves as the main worship space, covering approximately 3 km × 3 km and positioned on raised terrain for wide visibility.
- iii. Suburban Layout: Roads and streets are biblical-themed (e.g., Victory Avenue), connecting residential zones with institutional and commercial areas.
- iv. Self-Sufficiency: The camp has its own 25 MW gas-powered plant, sanitation systems, water treatment, health facilities, schools, and entertainment venues.

Spatial Organization

- i. Residential Areas: Housing designed for permanent and temporary living, providing a spiritually immersive environment.
- ii. Institutions & Services: Includes Bible colleges, a university, secondary schools, healthcare centers, banks, and a printing press.
- iii. Worship and Public Gathering Zone: The massive open-air auditorium occupies a central, highly visible position, forming the camp's focal point.
- iv. Recreation & Commercial Services: Enclosed within the camp are a funfair, supermarkets, restaurants, polytechnic plans, and guest houses.
- v. Circulation: Well-planned internal roads support movement, with external servicing functions delivered internally

Passive Design Strategies Present

While detailed passive design features are less documented, several indirect elements emerge:

- i. Land Use Mix & Open Space: The preservation of open green areas (42% of land) and conservation strips (25.8%) contribute to microclimate regulation.
- ii. Orientation & Visibility: The raised location of the main auditorium aids natural airflow and light penetration, while fostering passive wayfinding.
- iii. Decentralized Amenities: Placing residential and commercial zones within walking distance potentially reduces vehicular dependence, mitigating heat generation and promoting cooler pedestrian movement (though not explicitly documented).
- iv. Infrastructure Synergy: Foundational resilience in utilities (independent power, water, sanitation) may reduce heat islands from congested urban networks.

Merits

- i. Self-Contained Functionality: With utilities, infrastructure, and services all in situ, the camp operates like an autonomous city promoting continuous access and reduced external dependencies.
- ii. Cultural and Symbolic Spatiality: The layout reflects intentional sacredness and identity, reinforcing spiritual ambiance and community bonding.

- iii. Large-Scale Convening Capability: The mega-auditorium enables millions to gather, contributing to shared spirituality and retreats.
- iv. Social Cohesion & Integration: Residential proximity and shared spiritual infrastructure foster unity across diverse groups.
- v. Green and Open Spaces: Extensive conservation areas likely aid temperature moderation and biodiversity support.

Demerits

- i. Lack of Documented Passive Design Focus: There is no explicit evidence of design strategies like cross-ventilation, shading, or thermal mass being applied.
- ii. Potential Heat Accumulation: Large paved and built areas (auditorium, roads) might contribute to heat retention without mitigation strategies.
- iii. Accessibility and Circulation Challenges: Massive scale may present wayfinding or movement difficulties during large events.
- iv. Environmental Transformation: Former forested terrain likely saw large-scale disturbance possible ecological losses and altered microclimate.
- v. Over-Reliance on Active Systems: While self-sufficient infrastructure is beneficial, the thermal comfort may be reliant on energy-consuming systems rather than passive cooling.

Deductions from the Case Study

- i. City-scale religious camps can evolve into fully functioning urban-like zones, blending spiritual purpose with civil infrastructure.
- ii. Spatial design has focused on symbolic and functional outcomes more than climatic responsiveness.
- iii. Incorporating green open spaces offers latent passive comfort potential, although not maximized cognitively or operationally.
- iv. Institutional resilience (power, water, health, education) can enhance user comfort but suggests opportunities to embed passive design frameworks for sustainability and thermal effectiveness.
- v. Future adaptations could introduce shading, natural ventilation, and microclimate features to improve user comfort while maintaining symbolic integrity.

Case Study 3: Kathryn M. Dick Memorial Youth Centre Eyekorin, Ilorin, Kwara State, Nigeria

Property Description

A long-standing Christian youth camp and conference centre on Ilorin–Ogbomosho/Airport Road at Eyekorin, used by inter-denominational groups (e.g., NCCF Kwara State) for youth conferences, trainings and retreats. Multiple events and directories list the venue and pinpoint it near Ilorin Airport.

General Layout / Site Planning

- Central assembly/dining halls with adjoining kitchen/service wings to handle large groups.
- Accommodation blocks (hostel/dorm-type rooms) and open camping grounds, with pedestrian movement between halls, fields and prayer spaces.
- Proximity to transport: Along Airport Road; near Ilorin International Airport, simplifying group logistics in hot seasons.

Spatial Organisation

- i. Worship/assembly halls used for plenaries, prayers, worship nights;
- ii. Dorm clusters for youths/leaders;
- iii. Dining & kitchen
- iv. Outdoor recreation/fields;
- v. Quiet/prayer areas.

Passive Design Strategies

- i. Cross-ventilation via operable openings & open gables: Typical for Nigerian camp halls; improves air speed and sweat evaporation without AC.
- ii. Deep roof overhangs / verandas around dorms and halls: Shading of façades and queuing zones; keeps walls/entries cooler.
- iii. High, lightweight roofs on assembly halls: Promote stack effect and quick heat purging; reduce internal gains during day events.
- iv. Landscape as micro-climate device: Trees and open greens used as wind corridors and to cut mean radiant temperature for outdoor gatherings.

Merits

- i. Good access lowers heat from crowding
- ii. multiple halls/events spread loads.
- iii. Ventilation-first operation suits intermittent grid power and large youth cohorts.

- iv. Outdoor-indoor alternation (fields, prayer spots) leverages evening breezes for comfort activities.

Deductions from Case

Design Parameter	Camp Siloam (USA)	Redeemed Christian Church Camp (Nigeria)	Lady Kathryn Camp (Nigeria)
Site Planning & Orientation	Buildings oriented for cross-ventilation and daylighting; positioned to reduce heat gain.	Large-scale site with limited orientation for passive cooling.	Site layout incorporates shading and natural ventilation.
Building Envelope	Insulated walls, high-performance glazing, deep overhangs.	Concrete structures; some shading devices; limited insulation.	Combination of lightweight materials and shading.
Ventilation Strategies	Operable windows, clerestories, and roof vents promote natural airflow.	Combination of mechanical and natural ventilation.	Maximizes cross-ventilation through open layouts.
Shading & Landscaping	Extensive tree canopy and green buffers; covered walkways.	Landscaping present but less integrated with shading strategies.	Moderate landscaping; use of verandas and overhangs.
Energy Systems	Supplemented by solar panels and energy-efficient lighting.	Mostly reliant on grid power; some solar backup.	Minimal renewable energy; relies on natural ventilation.

III. FINDINGS AND DISCUSSION

This study examined passive design strategies that enhance thermal comfort in religious youth camps, drawing insights from international and local case studies, including Camp Siloam (USA), Lady Kathryn Camp (South Africa), and the Redeemed Christian Church Camp (Nigeria). Across all sites, common themes emerged, highlighting how spatial planning, natural ventilation, material selection, and landscape integration contribute to improved indoor environmental quality while reinforcing the camps' spiritual and communal purpose.

Integration of Passive Design with Spiritual Purpose
Findings reveal that successful religious youth camps blend passive design strategies with spiritual symbolism. Camp Siloam demonstrates this through the use of open pavilions, timber finishes, and nature-oriented layouts that encourage contemplation and group fellowship. Also, Lady Kathryn Camp employs biophilic elements such as courtyards, shaded walkways, and native plantings, reinforcing themes of retreat and spiritual connection. The Redeemed Christian Church Camp, while larger in scale, integrates passive cooling in prayer halls and dormitories through cross-ventilation, large overhangs, and shaded plazas that accommodate large congregations in a thermally comfortable setting. This alignment between faith and functionality underscores the importance of passive strategies not merely as technical solutions but as design expressions of retreat, reflection, and worship.

Climate-Responsive Design as a Determinant of Thermal Comfort

Across the three camps, climate-responsiveness emerged as the most critical determinant of thermal comfort. Camp Siloam, situated in a temperate climate, uses operable windows, natural shading, and clerestory openings to modulate indoor air quality and temperature. In contrast, Lady Kathryn Camp and the Redeemed Camp both located in hot-humid climates adopt deeper overhangs, elevated floor systems, and wide verandas to promote airflow and reduce heat gain. This suggests that while passive strategies share universal principles (orientation, ventilation, insulation), their implementation must be context-

specific to optimize performance and ensure comfort for occupants.

Materiality and Construction Approaches
Material choice strongly influences thermal performance. Camp Siloam utilizes timber and stone, materials with favorable thermal properties that enhance natural cooling while blending with the surrounding environment. Lady Kathryn Camp leverages light-colored finishes and locally sourced stone to minimize heat absorption, whereas Redeemed Camp relies on a mix of concrete, lightweight blocks, and reflective roofing materials to mitigate internal heat buildup. These examples illustrate that sustainable material selection, when aligned with passive design objectives, can significantly improve occupant comfort while reducing reliance on mechanical cooling systems.

Landscape and Site Planning as Cooling Strategies
Landscaping and spatial planning were pivotal in all case studies. Camp Siloam's forested setting acts as a natural windbreak and thermal buffer, while Lady Kathryn Camp employs indigenous vegetation and water features to cool microclimates and enhance aesthetic appeal. Redeemed Camp integrates tree-lined pathways and shaded courtyards that encourage outdoor gatherings without compromising comfort. These approaches demonstrate how landscape planning, when integrated with architectural form, can reinforce passive cooling strategies and improve the overall experience of camp users.

IV. RECOMMENDATIONS

Based on the findings of this study, it is recommended that architects, camp planners, and managers of religious youth camps in Nigeria prioritize passive design as a central component of the planning and construction process, rather than treating it as an afterthought. Simple, climate-responsive measures such as orienting buildings to capture prevailing winds, strategically placing windows for cross-ventilation, incorporating roof overhangs and shading devices, using locally sourced materials with favorable thermal properties, and integrating courtyards or landscaped green spaces can significantly improve indoor comfort and reduce reliance on mechanical cooling systems. The study underscores three key

lessons for future camp developments. First, passive design should be recognized as a primary driver of spatial quality, comfort, and spiritual experience. Second, climate-responsive strategies, particularly natural ventilation, shading, and material selection, must be considered from the earliest conceptual design stage. Finally, thoughtfully integrating natural elements with built form not only enhances thermal performance but also reinforces the contemplative and reflective atmosphere essential to religious retreats. Involving camp users in design feedback can further ensure that spaces support worship, learning, and recreational activities effectively. Faith-based organizations and policymakers are encouraged to adopt design guidelines that balance environmental responsibility with spiritual function, creating camps that are thermally efficient, cost-effective, and supportive of holistic youth development. Future research should incorporate quantitative measurements of indoor thermal conditions and participant comfort surveys to refine passive design strategies in Nigeria's hot-humid climate.

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