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ACHIEVING COMFORT THROUGH DAYLIGHTING AND CIRCULATION IN A SHOPPING MALL

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ABSTRACT

Over the years, the retail sector in Nigeria has seen an intense change and fast development, especially in the most recent decade to date, it has been dominated by small and unorganized business visionaries like shops, independent stores, boutiques, conventional privately-owned company stores, and so forth. With the developing worldwide financial forces, new monetary arrangements and special advertising systems will help generally to draw in customers in significant urban communities in Nigeria. It is imperative for the option of daylighting to be utilized within the shopping mall interior to provide the experience of Daylight while inside the mall. This will help enhance circulation through good visibility and minimize dependence on Artificial lighting during daytime in circulation areas of the mall. High window heights are also used to bring Daylight into deeper portions of large spaces. This design report focuses on examining strategies of daylight adoption into the shopping mall through high height windows, tubes light, skylight, shave light. etc, to enhance visibility of users during circulation within the mall.

Introduction

The Economist Journal defined a shopping mall as "one or more buildings constituting a network of shops representing merchandisers with interconnected pathways allowing customers to stroll from unit to unit." Restaurants and movie theaters are among the other businesses. Shopping has advanced significantly in recent years, with new forms, styles, and formats responding to demands for ease and simple access both physically and online. However, the emergence and dominance of huge multinational retailers have resulted in many independent and local businesses finding themselves unable to compete on pricing or availability of items owing to their size and influence in the marketplace (Watson 2005).

Large department shops in European towns have become tourist attractions in and of themselves. There are various locations to shop these days, with every kind of business conceivable, large parking lots, multi-screen movie theaters, and a diverse enough range of activities to keep a shopper occupied

for the whole day. There has been a progressive shift away from traditional markets and toward malls and plazas in Nigeria. Though this is particularly noticeable in big cities like Abuja, Lagos, and Port Harcourt, the traditional open market forms are still used. Even though these new malls tend to stay open late, several towns and cities still have market days on certain days.

According to Susilawati, Rahardjo, and Yudiyanty (2003), they "are not only concerned about tenant mix and services supplied in the shopping center, but also building quality that provides a pleasant atmosphere for them." The amenities, appearance, and interior design of the building contribute to its overall excellence. For the renters, each piece has a varied amount of value. Because it conveys comfort, choice, and luxury, the shopping mall has an ideological impact on customers.

In terms of mall user comfort, enough care must be given to the supply of sufficient and dependable lighting inside the mall to improve user visibility when moving about the shopping mall and prevent accidents. Due to the poor situation of Nigeria's electrical supply, it is now necessary to make suitable provisions for optimal daylight consumption inside retail malls to save money. Daylight should always be the preferred option for lighting an area throughout the day, according to Halliday (2008), unless the purpose prohibits it. It is advantageous since it consumes no energy.

Directionality, unpredictability, intensity, and color are all factors to consider. Electric lighting cannot perfectly replicate any of these aspects. When people realize that the light is Daylight, they are more tolerant of variations in light levels. It may, however, become a cause of irritation and need compensatory heating or cooling therefore it must be balanced against excessive heat loss, undesirable sun gain, or glare. As a result, natural light must be addressed with the view, space arrangement, and activities" (Halliday, 2008.p.226).

According to Steffy (1990), lighting profoundly impacts human behavior. Lighting influences the human sensory response, intended impressions, expectations, and subjective perceptions, according to Steffy (1990, p14) (visual clarity, spaciousness, relaxation, and sense of privacy). Lighting can guide activities as well. For example, Lam and William (1977, p62) investigated the influence of illumination on people's decisions about which tunnel to take, comparing a brilliantly lighted corridor to a poorly lit passage, and found that most participants preferred the highly illuminated passage.

Lighting consumes 35 percent of the energy consumed in buildings, according to Aljouburi (2012). The use of daylighting in Shopping Centre buildings with large volumes and many customers may reduce energy usage. The use of Daylight is justified by the volume, function, and number of people who utilize the public areas of shopping malls. High window head heights, high reflective ceiling and wall finishes, small floor designs, big facades and skylight openings with high transmittance glass are all connected with Daylight. Some open shopping center constructions have been created in nations such as Turkey (Aljobouri, 2012).

The aim of this project is to design a shopping mall for Bayelsa state that as effective use of Daylight through the adoption of some strategies. The objectives include the following,

- Examine some areas where daylighting will be very effective in the shopping mall.

- Assessment of daylighting strategies that can be adopted in the design of shopping malls.
- Outline the benefit of daylighting as an alternative source of light in a shopping mall.

Literature Review

Daylight improves the quality of the interior atmosphere in shopping malls, which attracts more consumers, according to a study conducted by the Heschong Mahone Group in California on the impact of Daylight on retail sales. With a 95% degree of statistical confidence, they discovered that daylighting increased sales by an average of 40%. (Claridge, 1994, p.28). Increased workplace productivity and occupant safety are two of the many advantages of Daylight.

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The historical background of shopping malls, classification of shopping malls, types of shopping malls, components of shopping malls, the current development of shopping malls in Nigeria, and effective daylighting strategies to improve circulation in a shopping mall are covered in this research review of the literature.

DAYLIGHTING CONSIDERATION IN SHOPPING MALL

The method of getting light into a building interior and dispersing it in a manner that delivers more desired and higher quality illumination than artificial light sources may be simply characterized as daylighting. (Halliday, p.225, 2008). Technically, "daylight" refers to sunlight that has been diluted by particles and clouds in the sky. Due to its unique properties of constantly changing patterns, which are useful for dynamic play on illumination architectural environments, as well as its great effectiveness, Daylight has long been regarded the most desirable light type (Deru, et al,2005, p.8). Unless the purpose clearly prohibits it, Daylight should always be the primary option for lighting a room throughout the day. Because of its zero energy consumption, directionality, variety, intensity, and color, it is advantageous. Electric lighting cannot perfectly replicate any of these aspects. When people realize that the light is Daylight, they are more tolerant of variations in light levels. It may, however, become a cause of aggravation and/or need compensatory heating or cooling, therefore it must be balanced against excessive heat loss, undesirable sun gain, or glare. As a result, natural light must be addressed with the view, space arrangement, and activities." (Halliday, p. 226)

Lighting, according to Steffy (1990), has a profound impact on human behavior. Lighting influences the human sensory response, intended impressions, expectations, and subjective perceptions, according to Steffy (1990, p14) (visual clarity, spaciousness, relaxation, and sense of privacy). Lighting has the ability to guide activities as well. Lam and William (1977, p62) investigated the impact of illumi-

nation on people's decision to utilize which tunnel. They discovered that the more brilliantly illuminated path was utilized by the majority of individuals.

Effective daylighting strategies in shopping malls.

According to Little fair 1990 bringing natural light further into the interior zones of shopping malls is possible with simple daylighting strategies such as

- Windows.
- Skylights.
- Light shelves
- Light tube
- Light wall colors.

WINDOWS

Windows are apertures in enclosure walls that allow light and air to enter the room. They offer directed daylighting and are ideal for horizontal surface and work plane illumination. Glare may be formed due to the stark contrast between the window opening and the nearby walls, causing visual discomfort be formed due to the stark contrast between the window opening and the nearby walls, causing visual discomfort.

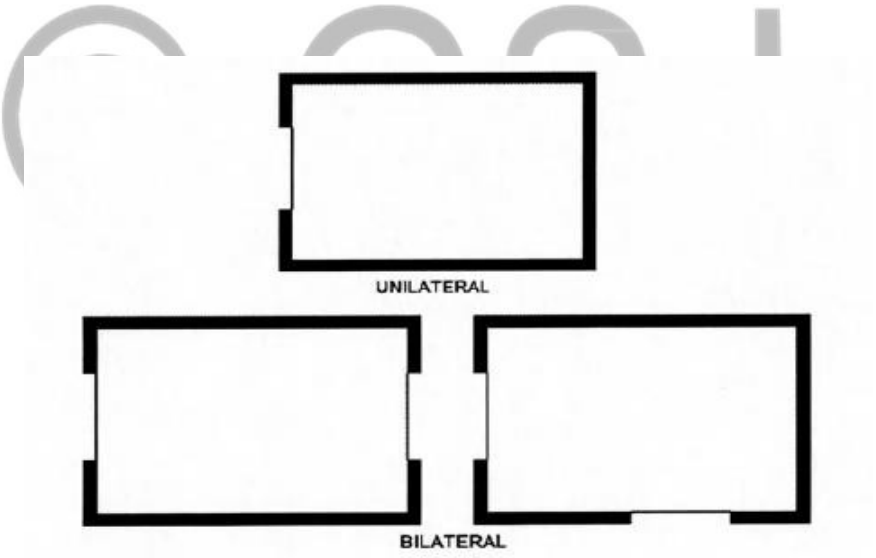
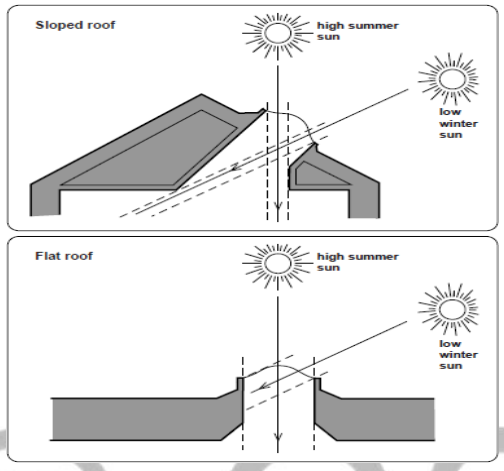


Figure 1: Showing different floor plan arrangement of windows

Source: Anjail G. 2005

SKYLIGHT

The light from both clear blue and clouded skies is referred to as "skylight." Cloudy sky may be brighter than pure blue skies, which many people are startled to hear. The brightness of clouded sky is mostly determined by the thickness of the clouds. At 8,000 foot candles, a light ocean mist may be extraordinarily dazzling, whereas clouds on a stormy day can practically blacken the sky.



Showing sun penetration on sloped and flat roof

Source: "Mahone, 1998"

METHODOLOGY

The present study used both quantitative and qualitative research procedures after performing a review of relevant literature and examining research methodology used in previous studies. This is first-hand information which is obtained from the study area. It consists of observations, interviews and photographic images. There is also a need to visit existing shopping mall. A total of four (4) case studies was used for this research work where three (2) was sourced locally from malls in Nigeria and one (2) from international shopping malls outside Nigeria. This method is a very reliable method to research which allows the individual a first-hand experience to the said facilities present in the selected areas. Four case studies were carried out; Three (3) of which are shopping malls situated in Nigeria and two (1) are foreign shopping malls. Photographs of the shopping malls were taken to enrich the research with information from the internet also the direct observation and visitation of the shopping malls in Nigeria.

SHOPPING MALL DESIGN PRINCIPLES

Principles in to be observed in shopping mall design necessary for a good and functional mall include:

- Anchor and Retailers
- Configuration
- Mall interior
- Shopping mall control

Analysis Of Results

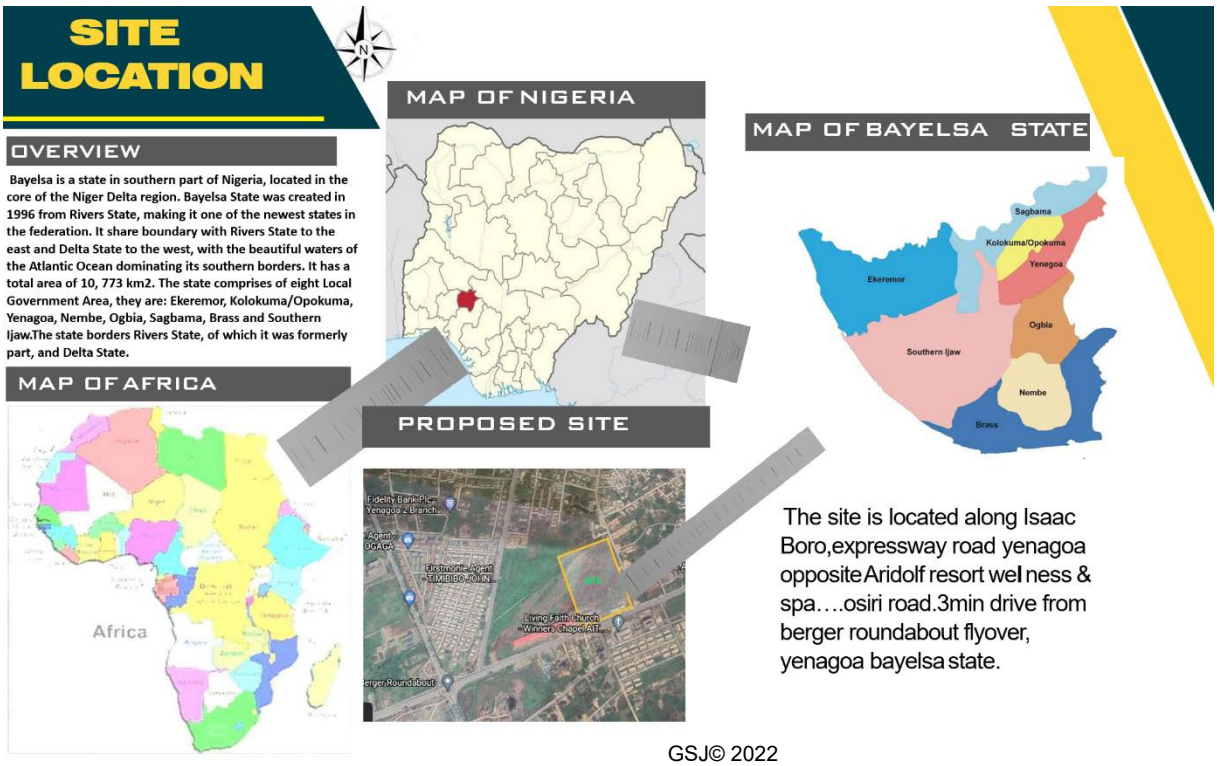
This chapter entails the presentation and discussion of data collected from the author's field work. This study was conducted to investigate the level of natural lighting features adopted in selected shopping malls. The chapter explains the data that was obtained through the questionnaire instrument and visual survey by means of case studies visited. The data analyzed were arranged and presented in chronological order in line with the objectives of the research.

SITE LOCATION STUDIES.

The success or failure of a project lies mostly in the selection of a site for such project. Carefully selected site enhances the success of any given project but a wrong site diminishes the success potentials of such project. Against the backdrop of the aforementioned, it becomes relevant to study the proposed site for the project situate at OKAKA,YENAGOA LOCAL GOVERNMENT ,BAYELSA STATE.

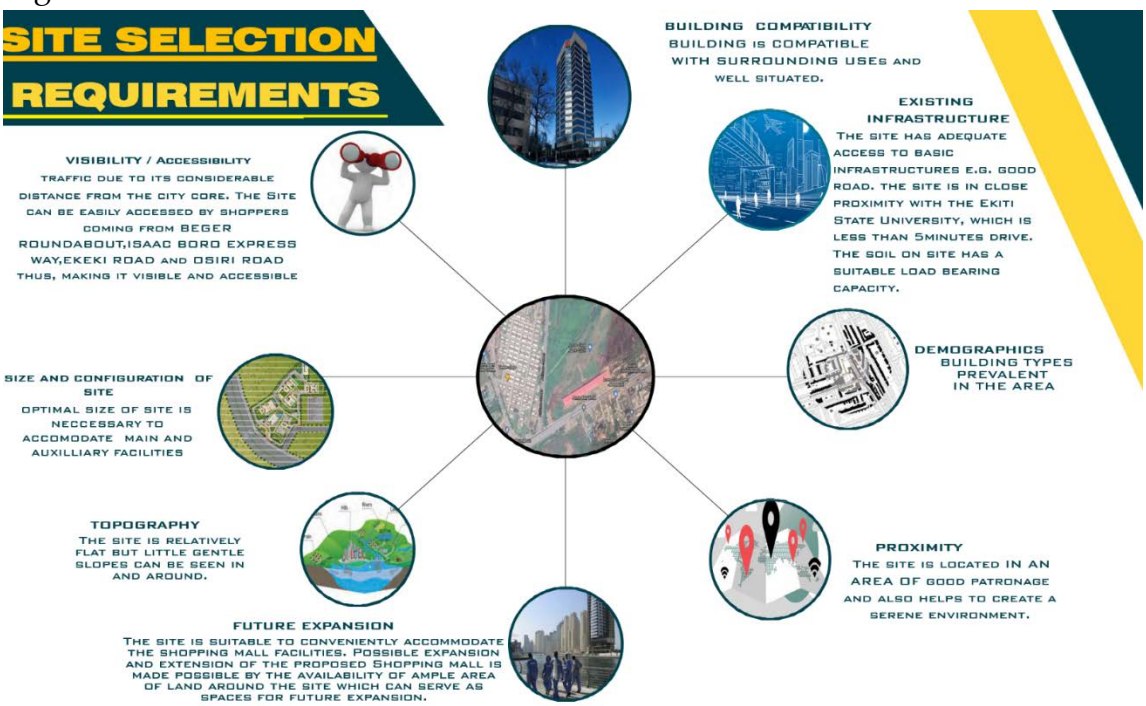
Background review of the study area

Bayelsa is a state in southern part of Nigeria, located in the core of the Niger Delta region. Bayelsa State was created in 1996 and was carved out from Rivers State, making it one of the newest states in the federation. It shares a boundary with Rivers State to the East and Delta State to the west, with the waters of the Atlantic Ocean dominating its southern borders. It has a total area of 10, 773 km2. The state is comprised of eight Local Government Areas, they are: Ekeremor, Kolokuma/Opokuma, Yenagoa, Nembe, Ogbia, Sagbama, hi Brass and Southern Ijaw. The state borders Rivers State, of which it was formerly part, and Delta State.



SITE SELECTION CRITERIA

In order to achieve a design capable of meeting its goals, the choice of a site for a water front development must be based on certain criteria. From studies done on existing case studies and literary materials, the following criteria informs the selection of a suitable site for a water front development.
Because of its physiological and psychological effects on consumers, lighting is an essential component to consider when designing a retail mall. The sensation of well-being that comes from being linked to the outside and the direction that comes with it. Artificial lighting must be well-integrated into the architecture of a shopping center to complement natural illumination. The use of artificial lighting is an important aspect of successful shopping mall interior design. They make it possible to present items as clearly and attractively as possible in order to entice people to buy. They also help to reduce glare and emphasize interior colors in a way that suits and complements the items on display.
The shopping mall is intended to let natural light into the shopping mall via an atrium with laminated glass and large windows on the external walls that disperse light rays from the sky evenly into the shopping mall interior.



GEOGRAPHIC AND CLIMATIC DATA OF YENAGOA.

RAINFALL and temperature: Yenegoa had the highest value 27.50C and 2531mm for temperature and rainfall respectively in Bayelsa. This indicate that Yenegoa temperature is 0.80C higher than other area. In terms of rainfall. The observed rainfall and temperature in the state is caused by continuous gas, increased urbanization and anthropogenic activities. The increased rainfall in these communities in Bayelsa State results in high level flooding with its attendance disasters in the state over the years. Rainfall distribution in decreasing order are: Yenegoa (1755mm - 3023mm), Anyama (1488mm -

2266mm), Southern Ijaw (1461mm -2215mm) and Brass (1402mm - 2014mm).

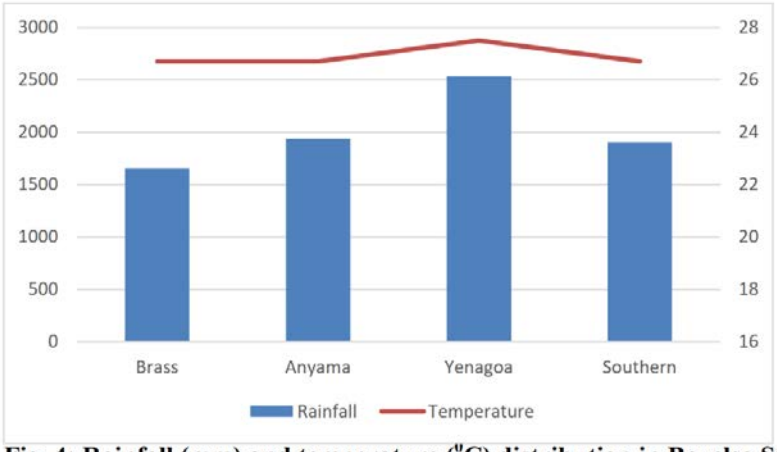


Fig. 4: Rainfall (mm) and temperature (^{0}C) distribution in Bayelsa State

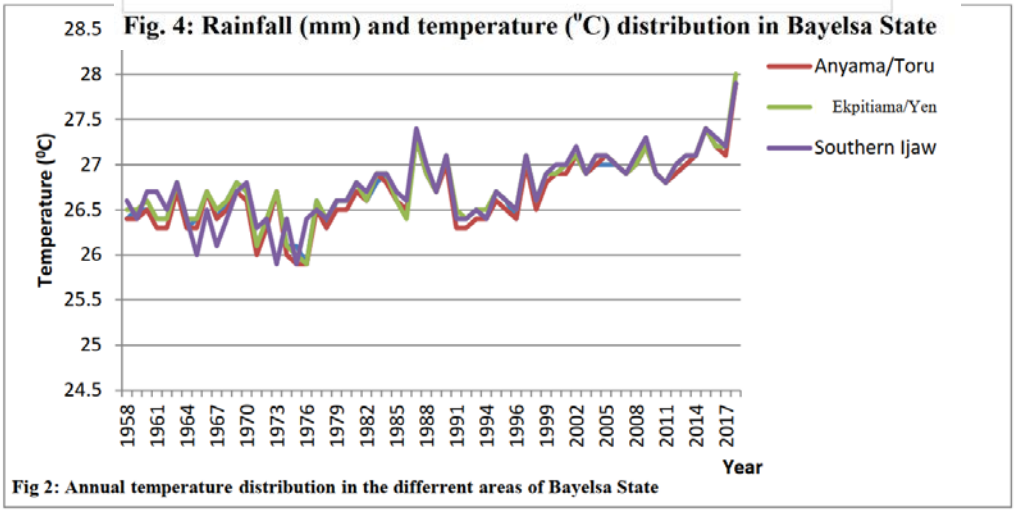


Fig 2: Annual temperature distribution in the differrent areas of Bayelsa State

SUNLIGHT

Typically, there is more sunlight during the dry season compared to the rainy season when there are smaller amounts. This primarily, is due to the presence of cloud covers during the rainy season. The highest sunlight value of 4.8 hours is recorded in April while the lowest amount of sunshine which is 1.7 hours is recorded in August. Excessive heat in building interiors due to solar radiation from sunlight is a major challenge to architects and it demands effective solutions.

Design Consideration for Effects of Sunlight

1. The general building orientation as well as the organization of interior spaces should take good consideration of the cardinal points and sun movement paths according to purpose.
2. Courtyards should be introduced where necessary to enhance the day lighting of interiors.
3. Providing of adequate eaves and over hangs to reduce excessive sunlight.
4. Effective use of horizontal and vertical shading devices like canopies, pergolas and fins to prevent direct sunlight from entering the building.
5. Creative use of natural shading elements like trees, shrubs hedges

6. Selection and effective use of materials which includes composition, resistivity/ reflectivity, colour, and others.

RELATIVE HUMIDITY

Relative humidity values for Abuja fall within a 62% - 86% range. The month of July which is the peak of the rainy season records the highest value while January (dry season) records the lowest value of 62%. The comfort zone associated with relative humidity is usually between 40% - 60%. Below 20%, discomfort due to excessive dryness of air is likely and shrinkage and cracking of woodwork can also occur. At above 70% the air becomes damp and conditions uncomfortable. This will encourage fungi growth and dampness, causing damage to building fabric and materials.

Design Considerations for Relative Humidity Effects

1. Provision for adequate ventilation of interior spaces to check formation of fungi and decay of organic matter.

2. Proper orientation of the building to allow for balanced air movement through spaces as well as sufficient sunlight.

3. Adequate fenestration for balanced air quality between indoor and outdoor spaces

CONCLUSION AND RECOMMENDATIONS

The ability to clearly identify the major concerns that facilitate/affect shopping mall designs is crucial to the construction of an effective and functioning shopping mall design. The case studies analyzed in this thesis demonstrate that shopping malls provide a home for retail, entertainment, and leisure with significant expansion potential. Individual case studies are all successful initiatives that show that shopping malls may be effective in smaller settings and that these sorts of projects can have significant community benefits.

The importance of daylight consideration in shopping mall design has been underlined by this research. Even in the most stable periods, buildings and the districts they inhabit are not static artefacts, and they need some alteration to stay beautiful, secure, and useful throughout times of social and technological upheaval. It's also worth noting that the greatest shopping mall structures are ones that can adapt to changing purposes, use norms, and lifestyles.

In contemporary civilizations, shopping mall construction is a means of boosting modern commerce, leisure, and relaxation. When commencing on such undertakings, greater consideration should be given to the facility's long-term viability. Users, the environment, and future demands must all be considered while creating a design that can boost productivity. The use of effective day lighting and circulation in the design of the proposed shopping mall is investigated not only for the supply of spaces required for retailing and recreational activities, but also for the evaluation of the facility's long-term influence on the users. To achieve this, the recommendations are made;

- The use of the outlined daylighting strategies in this report.
- The use of flexible internal partitions like reinforced glass and High pressure laminated board should be encouraged in urban spaces.

- Architects should always foresee possible expansion of urban spaces within a shortest possible time.
- Crime is an important barrier and a sensitive subject to shopping. Shopping mall exhibit different successful tenant mixes that are not common with other retail markets and should be referred with upmost security to the core.
- Good shading should be provided to prevent glare
- Inadequate parking can create barriers to successful Shopping mall developments. Specific financing and policies should be created to solve parking problems in Shopping mall in particular and urban spaces in general
- The development of Shopping mall should be explicitly focused on efficiency of the spaces provided in other to meet up with urban commercial revitalization policy and strategy.
- Good interior finishes should be provided for effective patronage and satisfaction of window shoppers which could be part of recreational purpose of a Shopping mall.

References

Deru, M., & Torcellini, P. (2005). Performance metrics research project-final report (No. NREL/TP-550-38700). National Renewable Energy Lab. (NREL), Golden, CO (United States).

Lam, W., & William M. C. (1977). Perception and lighting as formgivers for architecture McGraw-Hill. Inchiesta.

Watson, D. (2005). Time-Saver Standards for Building Materials & Systems, McGraw Hill Companies Publications, USA, p.1-44

Susilawati, C., Rahardjo, J., & Yudiyanty, Y. (2003). Measuring building quality of shopping centres In Surabaya by analytical hierarchy process. In Proceedings of the 9th Annual Conference of the Pacific Rim Real Estate Society (pp. 1-11). Pacific Rim Real Estate Society.

Halliday, S. (2008). Sustainable construction. Routledge.

Steffy, G. (2002). Architectural lighting design. John Wiley & Sons.

Lam, W. M., & Ripman, C. H. (1977). Perception and lighting as formgivers for architecture (Vol. 248). New York (NY): McGraw-Hill.

Claridge, D. E., (1994). Preliminary Study of O&M Opportunities at the University of Texas Medical Branch at Galveston, Submitted to The Energy Management and Operations Department at UTMB Galveston.