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The usage of Natural Lights in Hotels and Resorts in Saudi Arabia

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ABSTRACT

The use of natural light in hotel and resort design is becoming more common, particularly in countries like Saudi Arabia, which have a lot of sunlight. These days, more and more people are becoming conscious of the importance of sustainable practices, which, along with enhancing tourist experiences, offer unique design options presented by the local climate and geography. This abstract demonstrates the benefits and drawbacks of incorporating natural light into the Saudi Arabian hospitality industry. Two major advantages to hotels and resorts are that they use natural light sustainability and energy efficiency. Since the days in Saudi Arabia are long and bright, one option to reduce energy consumption is to utilize natural light instead of artificial lighting. Reduced energy use and carbon emissions are two ways these companies are contributing to global and national sustainability goals. Some daylighting options that may boost natural light and lessen the need for artificial lighting throughout the day include skylights, large windows, and light wells. The quantity of natural light that penetrates a room greatly influences how guests feel throughout their time together. According to a study, natural light has several benefits, such as improving mood, increasing productivity, and regulating sleep duration. Saudi Arabian hotels and resorts catering to vacationers and business travellers can find that offering these benefits makes customers more satisfied and loyal. A great instance involves how natural light can improve the mood of a room or common area, making it more welcoming and delightful. To make the most of natural light, Saudi Arabian hotels and resorts need precise architectural planning. It is crucial to balance light intake and thermal comfort in this region because of the intense sunlight and high temperatures. Many contemporary sliding innovations, such as low-emissivity (Low-E) glass, notify light while preventing heat escaping. To further minimize the chances of glare and overheating, shade structures such as pergolas and openings can control the amount of sunlight entering the building. By strategically using natural light, architects and interior designers of hotels and resorts in Saudi Arabia can include artistic and cultural themes. Gardens and mashrabiya screens have used considerable natural light throughout history, two essential components of Arabian architecture.

Keywords: Sustainability, Natural Lighting, Energy Consumption, Hotels and Tourist Resorts.

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1. Introduction

Conventional methods of enhancing natural light in Saudi resorts and hotels have malfunctioned. These solutions strive to bring natural light into lobbies, hallways, and guest rooms through huge windows, skylights, and atriums [1]. In contrast, the region's severe heat and sunlight may cause guests to feel uncomfortable and increase cooling needs. Ancient buildings used towering walls, narrow windows, and shady courtyards to reduce heat [2]. Thus, less natural light entered the structure. These designs kept the heat out, nevertheless they created dark interiors that required more daytime lighting and reduced efficiency [3]. Because previous building orientations did not always promote sun access, light dispersion was inconsistent. Since passive solar architecture, which balances sunlight exposure, hadn't been used in Saudi Arabia, daylighting potential was misused. Light-diffusing glazing technology and materials have historically been underinvested [4]. This has left older buildings without effective solar protection. Due to this, these solutions often failed to meet everyone's comfort, energy efficiency, and aesthetic needs [5]. Inefficient artificial lighting and air conditioning have raised energy consumption and operational expenses at some local hotels and resorts because there are no specific solutions to collect natural light and reduce heat [6]. These restrictions must be overcome for sustainability and guest comfort [7].

Although Saudi Arabia has a difficult climate, hotels and resorts are seeking to balance aesthetics, comfort, and energy economy when using natural light [8]. It is difficult to use large windows and open spaces without adding heat due to bright sunlight and high temperatures. This may cause the building's interior temperature to rise, requiring extra air conditioning [9]. Increased cooling loads directly affect operating expenses, complicating the already difficult task of maximizing energy efficiency while ensuring guest comfort [10]. Many buildings struggle to balance natural light, glare, and heat discomfort despite advances in glazing technology like low-emissivity and double-glazed windows [11]. To make matters worse, many older buildings were not constructed to use natural light. Retrofitting to maximize natural light is difficult and expensive [12]. Preventing direct sunlight from causing hot spots and uneven illumination is another issue in achieving continuous natural lighting across a structure [13]. Cost and technical inexperience additionally hampered development of automatic shading systems and light-diffusing materials. More regional study and solutions are needed to account for Saudi Arabia's varied weather circumstances, which affect solar intensity and quantity [14]. Finally, designing hospitality areas that use natural light is difficult and requires new technology and design.

Hotels and resorts in Saudi Arabia must embrace innovative architecture, modern technology, and climate-adaptive solutions to address excessive natural light. Double or triple-glazed windows with low-emissivity coatings are essential to high-performance glazing systems. These systems let in lots of natural light and prevent heat gain and glare. Glazing solutions like these reduce artificial lighting and cooling, improving energy efficiency. Keep these systems operating to balance artificial and natural light all day to keep people warm and comfortable. Light-diffusing skylights

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and windows, such as frosted glass or translucent panels, can reduce glare and create a relaxing atmosphere. Architecture like orientation-based design, which positions buildings to get the most sun during cooler hours, helps urban expansion. Buildings can get additional natural light by adding light wells, courtyards, and atriums. Solar gain need not increase significantly. Upgrades to daylighting systems and reflective surfaces may help illuminate gloomy areas in older buildings. During design, architects can utilize energy modeling tools to model the effects of daylighting alternatives. This improves decision-making. Combining these ideas may reduce our environmental impact, save energy, and improve our guests' experience.

Saudi Arabian hotels and resorts' largest natural light utilization difficulty is balancing energy efficiency, visitor delight, and harsh sunlight and heat. Region's scorching temperatures and long, bright days cause warmth, glare, and higher cooling needs. While natural light can reduce energy usage and make a space more pleasant, it additionally comes with drawbacks. To maintain thermal comfort and maximize natural light, innovative architectural planning and technology are needed. Buildings that integrate ecological practices with cultural heritage make balancing aesthetics, comfort, and energy savings more difficult.

Objectives

- Reduce the use of artificial lighting and maximize natural light to preserve authority. This strategy will have less of an adverse effect on the environment from resorts and hotels.
- The ambience of any room may be significantly improved by allowing in natural light. Studies have shown that the amount of natural light we're exposed to affects our psychological state, productivity at work, and relaxation levels. A better experience means more satisfied customers who are more inclined to return.
- To reflect the area's history, take cues from aged Arabian architecture and use natural light. Guests worldwide may have a genuine experience at hotels and resorts incorporating cultural influences into contemporary design for promoting the identity of Saudi architectural heritage
- Saving money over time is possible by lowering energy costs for artificial lighting. Incorporating a sustainability strategy that prioritizes natural light into hotel and resort design could give an element of eco-friendliness, rendering them more appealing to eco-conscious travellers while possibly raising their rates to achieve sustainability
- Modern construction and engineering can withstand the extreme temperatures and sunshine of the area. Modern construction materials provide year-round comfort and energy efficiency via automatic shading devices and dynamic glazing systems.

The following is included in this section II, which organizes the structure of the research paper: The utilization of natural light in hotels and resorts in Saudi Arabia is the subject of the second section of this study. In this dissertation, the section III will be devoted to discussing low-emissivity (Low-E) in significant detail. Detailed examination, a comparison to earlier approaches, and an analysis of the consequences

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are all included in Section IV of the report. Section V contains a complete examination of the outcomes that were taken into consideration.

2. Literature Survey

The Kingdom of Saudi Arabia has made considerable steps in recent years to boost its tourism economy and encourage sustainable practices in the hotel and design industries. Numerous studies have examined innovative tourist growth and environmental responsibility strategies that incorporate local history, green investment, and eco-friendly designs.

Abouzaid, A et al., [15] Creating contemporary industrial lighting units for Radisson Blu Neum hotels is the goal of the suggested method, which incorporates the utilization of Jazan heritage designs (JHD) and environmentally friendly materials such as shura trees, laser technology, and waterjet design. A better understanding of cultural traditions, environmentally responsible lighting solutions, and sustainable design are some of the outcomes.

Ibrahim, A. O et al., [16] proposed for the purpose of determining the extent to which Ha'il's tourism sites (HTS) and events contribute to the expansion of tourism in Saudi Arabia, the proposed method comprises conducting an analysis of these factors alongside other Saudi attractions. Increased economic growth and variety in the tourism industry are among the outcomes.

Abou Amer, A et al., [17] proposed focus group discussions and semi-structured interviews with hotel managers are the two methods that are included in the qualitative research (QR) methodology that has been developed. The outcomes include increased awareness of green energy and water practices in five-star hotels as well as their adoption of these practices.

Abdou, A. H et al., [18] proposed a web-based questionnaire and structural equation modeling (SEM) are the two components of the suggested method that will be utilized to conduct an analysis of the factors that influence green investment (GI). GI has been shown to improve environmental, economic, and social performance in hotels that are environmentally conscious, according to the results.

Zuhairy, D. A et al., [19] for the purpose of informing the design of an eco-resort in Jeddah that is 17,100 square meters in size, the proposed method entails conducting an analysis of three case studies. The end result is a resort that puts an emphasis on nature and provides opportunities for relaxation, education, and tourism attractions.

Ibrahim, A. O et al., [20] invented the method that has been suggested includes doing analytical and descriptive analysis (DA) on the tourist destinations in Hail. Hail will be positioned as a leading destination as a result of the outcomes, which include the identification of major attractions and the recommendation of ways to improve tourism.

The examined research papers demonstrate a commitment to improving Saudi Arabia's tourism business through eco-friendly and innovative ways. The results suggest that Low-E (low-emissivity) technologies are the most sustainable. This discovery supports the tourism industry's environmental transformation.

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3. Proposed method

The present paper analyses sustainable lighting design, hotel room lighting plans, and smart lighting systems. Emphasising space design, modern lighting technology, and efficient management systems, Figure 1 presents a complete solution for ecologically friendly natural lighting. Figure 2 lists many LED lighting options for hotel rooms designed for utility and ambiance. Figure 3 explains the logical architecture of a smart lighting system by combining multiple agents and databases to maximise energy management and user experience.

Contribution 1: Designing a Sustainable Lighting Blueprint

It proposes a combined approach to maximise the natural lighting in Saudi hotels and resorts. Combining energy efficiency with cultural significance in the architectural environment of the neighbourhood, historic elements such mashrabiya screens, low-E glass and shading systems mix.

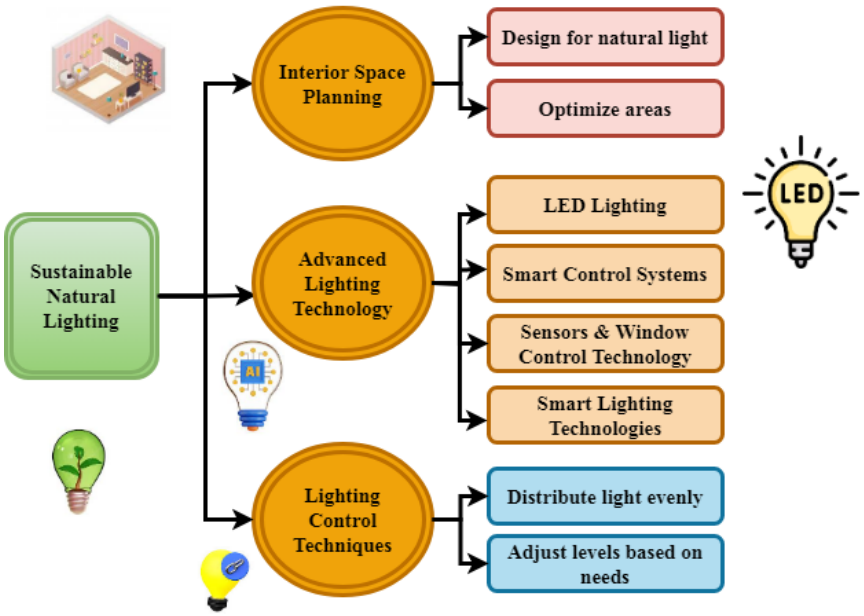

Figure 1: Integrated Approach to Sustainable Natural Lighting Design

Figure 1 presents a whole strategy for acquiring environmentally friendly natural lighting for buildings. Emphasising three basic components Interior Space Planning, which focusses on maximising layout for natural light; Advanced Lighting Technology, which uses energy-efficient solutions including LED, smart controls, and sensors; and Lighting Control Techniques meant to distribute light evenly and change it depending on real-time needs. Key design features such large windows, transparent materials, and outdoor courtyards assist to enhance natural light utilisation, thus reducing the use of energy and so creating a better, ecologically friendly interior space.

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$$K < Mt(v - bj'') \geq F\{\forall_2 A - Bq''\} + Dsv'' \quad (1)$$

A framework for evaluating the harmony between thermal comfortDsv'', natural light utilization and hotel and resort architecture are provided by equation 1. In this case, K represents a constant for optimum light penetration, and $Mt(v - bj'')$ represents the modulation of light depending on changeable factors$F\{\forall_2 A - Bq''\}$. This disparity stands for the minimum levels of energy efficiency that must be achieved to achieve sustainability objectives.

$$P < Wa\{Hg - ty''\} > Cv < X + sq'' > \quad (2)$$

The equation 2,P measures how much natural light is used in comparison to thermal effects$Hg - ty''$, and the equation Wa measures how important natural light is in influencing the perceived quality of the environmentCv. Light and thermal comfort, denoted by $X + sq''$.In the equation, needs to be balanced for the design to maximize energy efficiency and visitor happiness.

$$Sa < Gj(\partial - Kp'') > Fd < \partial + Ew'' > \quad (3)$$

Spatial aesthetics is represented by the equation 3Sa, and the influence of natural light on guest perceptions is evaluated by $Gj(\partial - Kp'')$. Ensuring that natural light enriches the entire visitor experience while preserving comfortFd and energy efficiency$\partial + Ew''$ is crucial, and equation 3 highlights the significance of striking a harmonic balance between aesthetics and practicality.

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Figure 2: Hotel room equipped with simple LED lighting

Designed to provide a visually pleasing and useful environment, Figure 2 displays the many lighting options accessible inside hotel rooms. Apart from reading lamps next to the bed for convenience, the room has ceiling lights for overall illumination, RGB mood lighting for ambiance, cabinet lighting for utilitarian purpose. Desk lights provide areas of work focused lighting. Mirror lights in the bathroom help with grooming; ceiling lights and night lighting balance this for comfort and security. In many hotel rooms, these meticulous lighting choices enhance the guest experience by combining efficiency with a pleasant, customised setting.

$$\varepsilon < \gamma + \alpha\nabla'' \geq \ \omega < \propto -\mathrm{Rtz}'' + \mathrm{Mk} > \quad (4)$$

Natural light ɛand heat regulation are included in equation 4,$\gamma + \alpha\nabla'' \geq$, whereas the energy consumption threshold is denoted by ω. The disparity suggests that the design methods for Saudi Arabian hospitality spacesMk are impacted by the importance of energy efficiency $< \propto -\mathrm{Rtz}''$.Equation 4 deals with improving visitor comfort and reaching sustainability objectives.

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$$K(W - rt'') = Fz < M - jk'' > Q(pk - lj'') \quad (5)$$

The constant for light optimization is represented by the equation 5,$W - rt''$, and the balance between natural light intake and heat resistance is shown by K. The sustainable practices in the Saudi Arabian hospitality business may be driven by the increased$Q(pk - lj'')$ operational efficiency and visitor comfort brought about by the efficient utilization of natural light, as shown on the right side of the equation ($Fz < M - jk'' >$).

$$< L'(Er + fg'') > Px - Np < Sa - bv'' > \quad (6)$$

The equation 6,L shows the amount of natural light that is used, and the equation Er shows the environmentalfg″ and functional advantages that come from this light$Px - Np$. To ensure that sufficient natural light improves overall experiences$Sa - bv''$ while reducing negative thermal impacts.The equation highlights the need for a positive association between light quality and visitor happiness.

Contribution 2: Bringing Natural Light into Action

The suggested approach uses precision architectural design to regulate natural light and heat by means of wide windows, skylights, and shading systems. These design ideas reduce artificial lighting, therefore saving energy and improving visitor experience.

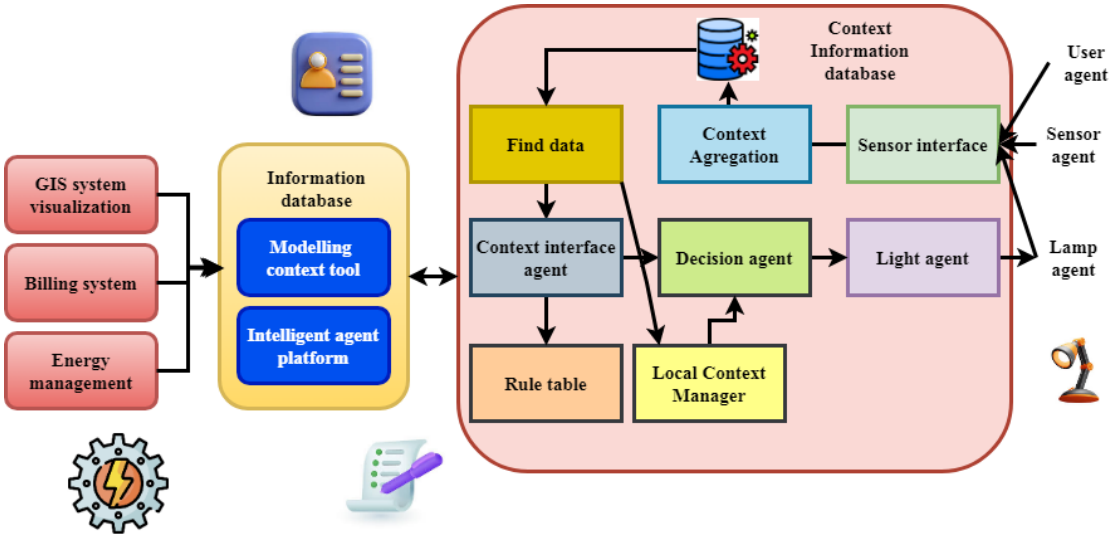

Figure 3: Logical architecture of the Smart Lighting System

Figure 3 shows an intelligent lighting control system maximising user experience and energy management by integrating several agents and tools. Interacting with an intelligent agent platform and modelling context tool stored within the information database are external systems like GIS, billing, and energy management. Data is compiled by the context interface agent under guidance of context aggregation from the context information database and a find data process. The local context manager manages choices locally; the decision agent bases his judgements on a rule table. The

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system connects light agents and sensor agents depending on user decisions to produce dynamic and flexible lighting surrounds.

$$|U - Yt''| = Fc < Q - bz' + Yp > \quad (7)$$

Natural light has an impact on user comfort ($U - Yt''$) in hotel and resort settings$Q - bz'$, and this connection may be measured using the equation 7. In this context, the natural light's thermal influence is denoted by Fc and the functional comfort requirements, which aim to balance light exposureYp with thermal regulation. This equation is in line with the sustainability aims of Saudi Arabian restaurant design and emphasizes visitor enjoyment.

$$\frac{1}{2}||\partial M - Hj < Kp - vfd'' \geq Kq < \delta + Er'' > \quad (8)$$

The equation ($\partial M - Hj$) shows how natural light is modulated, and the symbol $\frac{1}{2}Kp$ denotes the minimum temperature that may be toleratedvfd''. To ensure that the architectural techniques used contribute to environmentally$Kq < \delta$ friendly procedures while improvingEr'' the visitor experience.It is necessary to achieve a balance between thermal comfort and natural light utilization, as shown by equation 8.

$$n < kP - NV'' \geq eWQ < vGJ - KPI'' > + jG'' \ (9)$$

The net energy performance$vGJ - KPI''$ affected by thermal and natural light is denoted by $kP - NV''$ and the minimal comfort threshold is represented by the equation 9,n. To optimize the visitor experience and fulfill sustainability objectivesjG'', the equation stresses the importance of energy efficiency, which is represented by eWQ. It guides architectural choices in Saudi Arabian hospitality settings.

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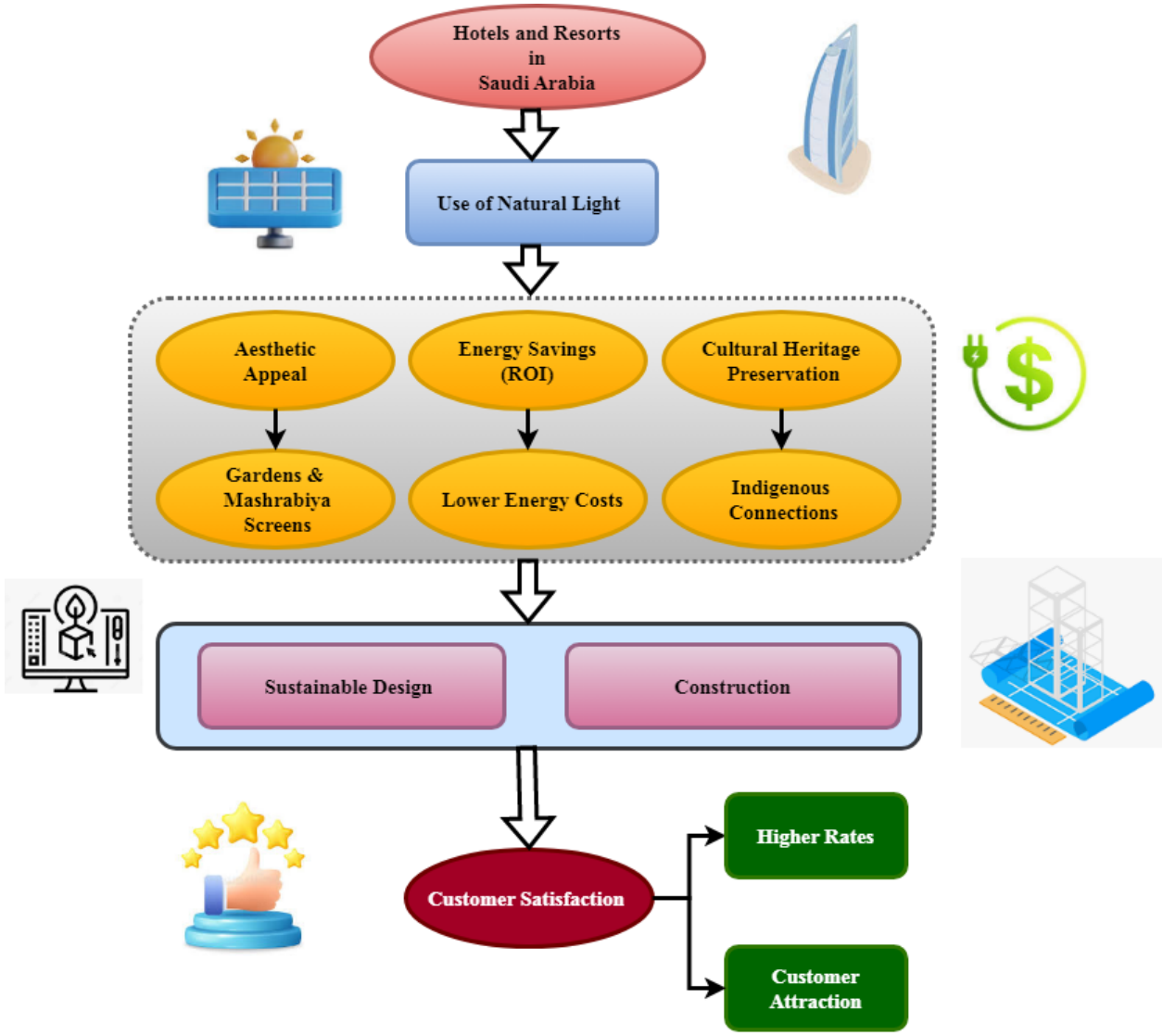

Figure 4: Leveraging Natural Light in Hotels and Resorts in Saudi Arabia

Figure 4 highlights how deliberately Saudi Arabia's hotels and resorts use natural light to strike design, energy economy, and cultural heritage balance. Although lower energy expenditures translate into a return on investment (ROI), the visual attractiveness is mostly based on elements such as gardens and vintage Mashrabiya screens. By keeping links to indigenous cultures, these designs encourage sustainable construction. These components combined together make the customer happy, which improves rates and raises consumer appeal. Generally speaking, the eco-friendly architecture provides local hotels and resorts with a competitive advantage suitable for modern sustainability goals as well as history preservation.

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$$d_1 = fG < M - nbw'' > + Ty(\partial + Rt'') \quad (10)$$

The total efficacy of the design is shown by equation 10d_1, and the beneficial influence of natural light on attitude and comfort$\partial + Rt''$, taking into account any possible Tynegative thermal effects is captured by the equation fG. The phrase $M - nbw''$emphasises the significance of balancing light. It even determines temperature via design decisions to produce a sustainable.

$$2 > P < M(\partial wq' - Rt) > K\forall - mp'' \quad (11)$$

The performance measure is represented by the equation 11,P, and the efficiency of natural light in improving the guest experience$K\forall - mp''$ while reducing negative thermal impacts is shown by $M(\partial wq' - Rt)$. It is important to strike a balance between light exposure and comfort and efficiency, as shown by the equation on energy consumption analysis.

$$D < Pk - ljh'' \geq Tf(M + ntr'') - Fdw(S - tq'') \quad (12)$$

The ideal comfort level is represented by the equation 12,D, and the net influenceFdw of natural light on overall happinessTf(M + ntr′′), factoring in thermal discomfortS − tq′′ is shown by Pk − ljh′′. To improve visitor experiences and guarantee energy efficiency, equation 12 highlights the need to manage light and heat dynamics effectively on sustainable design practices analysis.

Contribution 3: Measuring the Impact of Sustainable Lighting

Analysis of energy savings, environmental benefits, and visitor satisfaction reveals technique success. It analyses energy usage and carbon emission reductions using mathematical equations, therefore demonstrating the possible value of the method to support hotel industry sustainability and economics.

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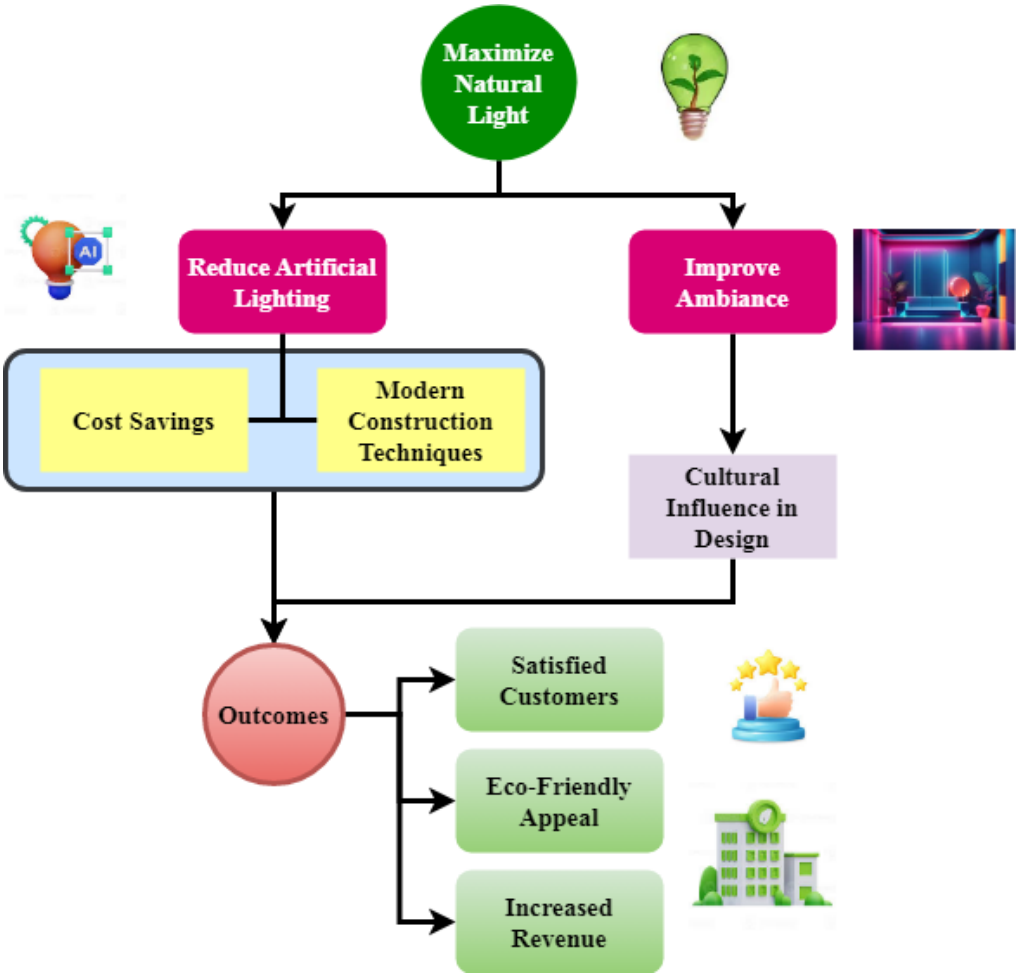

Figure 5: Integrating Natural Light for Sustainable and Modern Design

Figure 5 shows how to maximise natural light in architectural design, therefore improving utility as well as beauty. Modern architectural methods might save costs and increase energy efficiency by minimising the need for artificial illumination. Warm and visually appealing settings help to enhance the mood by means of impacts of cultural design. Among the significant results of these initiatives are improved environmentalist reputation, happy consumers, and more money. Natural light improves not just sustainability yet additionally user experience, thereby supporting long-term success in design and building projects.

$$K_v < F - dt' \geq K(Eq' - Rt < \forall + rq'' >) \quad (13)$$

The equation 13,K_v denotes a comfort threshold that may be changed, while the expression $F - dt'$ shows how much natural light improves$Eq' - Rt$ the interior environment$K$ by reducing the need for artificial lighting$(< \forall + rq'' >)$. A systematic approach to natural light may lead to greater sustainability, as seen emphasizes the

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requirement of balancing energy usage with thermal comfort on guest experiences and satisfaction analysis.

$$\propto_2 W < R - qw'' \geq Ra < A - wt(B - ng'') > \quad (14)$$

The weight of natural light's influence$B - ng''$ on the visitor, comfort is represented by the equation $\propto_2 W$, and the net advantages$A - wt$ of light exposure versus possible temperatureRa discomfort are reflected by $R - qw'' \geq$. The importance of considering thermal management with light in well-planned designs is shown in Equation 14 of natural light improves both functionality and visual appeal on thermal comfort analysis.

$$\varepsilon < \nabla\exists - Tr'' \geq Ws < \varepsilon + \delta l' - xz'' > \quad (15)$$

The comfort level that is considered acceptable is represented by equation 15,$\varepsilon < \nabla\exists - Tr''$, and the successful$xz''$ integration of natural light$\varepsilon + \delta l'$ versus thermal discomfort is indicated by Ws. The importance of using natural light to maximize visitor pleasure and minimize heat-related problems is shown by the equation on environmental impact analysis.

As Figure 1 illustrates, sustainable design calls for employing modern techniques to maximise natural light, therefore reducing energy use. Thoughtfully chosen lighting solutions enable hotel rooms (Figure 2) to enhance visitor comfort and look. The smart lighting system (Figure 3) generates dynamic and efficient lighting settings by combining advanced energy management features with user preferences. These approaches applied together enhance user enjoyment and sustainability.

4. Results and Discussion

Saudi Arabian hotels and resorts should incorporate natural light into their architecture because it has been shown to improve energy efficiency, guest satisfaction, and environmental preservation. Regarding energy consumption, sustainable design, guest experiences, thermal comfort, and environmental impact, natural light is essential for eco-friendly and profitable hospitality solutions.

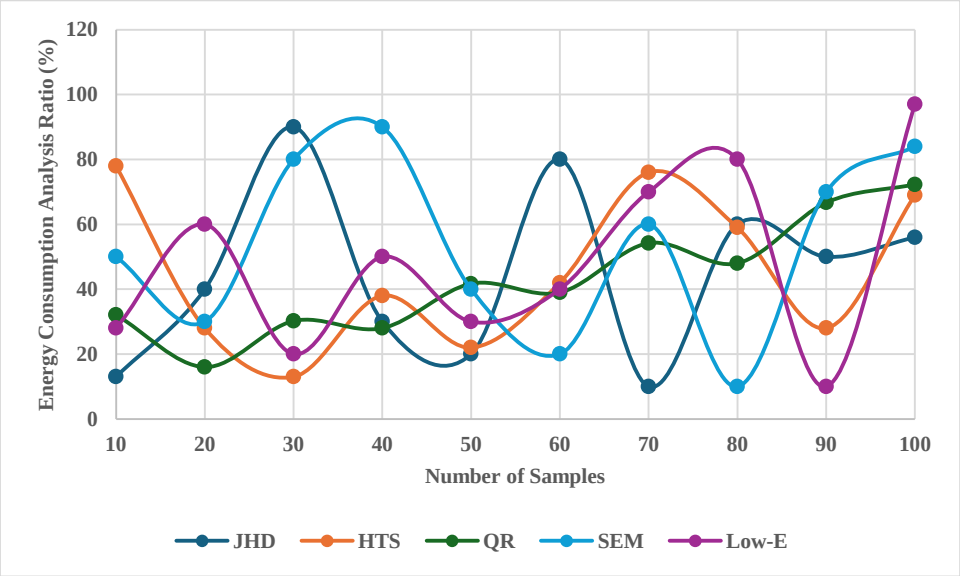

Figure: 6 Energy Consumption Analysis

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In the above figure 6, an investigation of energy usage related to natural light utilization revealed a substantial opportunity for energy savings in Saudi Arabian hotels and resorts. During the day, natural light can be employed as a main source of illumination due to the lengthy and sunny days in this location. The need for artificial illumination is thus diminished, leading to a decrease in electricity use. Architectural elements such as skylights, large windows, and light wells let natural light into inside spaces, which helps to lower the energy needed for lighting. Furthermore, automatic shading systems and low-emissivity (Low-E) glass ensure efficient use of natural light while reducing heat input, relieving cooling systems of some of their burden. The extreme heat in Saudi Arabia could lead to a surge in the need for air conditioning, making this an extremely important matter there. Hotels and resorts can reduce their energy usage by including these characteristics into their design. This is because they help achieve a balance between the amount of natural light that enters the space and the thermal comfort that guests experience. This results in lower operating expenses, which helps to ensure that the initial investment in a light-focused design is financially viable produces 97.6%. In addition, these facilities will be at the forefront of eco-friendly hospitality due to their reduced energy use and carbon emissions, which are in line with national and international sustainability goals.

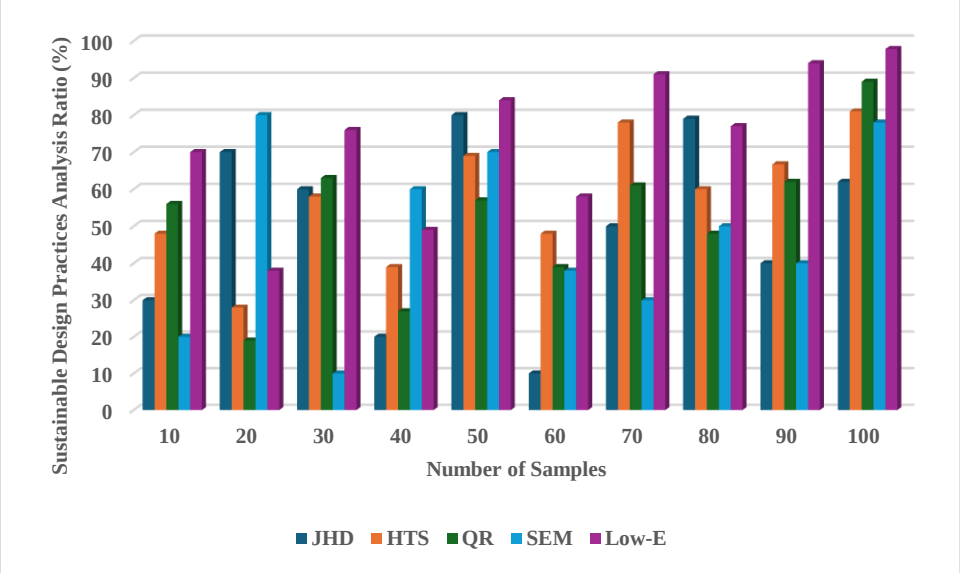

Figure: 7 Sustainable Design Practices Analysis

These initiatives aim to reduce energy usage in Saudi Arabian hotels and resorts by employing natural light, cultural and environmental variables, and sustainable design. In the above figure 7, buildings must take use of the country's sunny atmosphere to maximize natural light and reduce energy use. Daytime artificial illumination can be minimized by skylights, light wells, and large windows. Together, these characteristics let in lots of natural light. Sustainable designs use automatic shade systems and low-emissivity (Low-E) glass to block the area's excessive heat and sun.

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Thus, cooling systems are not overworked, improving thermal comfort without reducing energy efficiency. The addition of pergolas, mashrabiya screens, and plants enriches the area's cultural and aesthetic value, linking modern hospitality rooms and traditional Arabian interior design. Hotels and resorts can strategically place windows to improve customers' moods, well-being, and connection to nature produces 98.4%. Economic benefits from sustainable design, such as lower energy and operational costs, justify the early investments. Saudi Arabia's hotel business follows worldwide sustainability trends, supporting claims of cultural and environmental awareness.

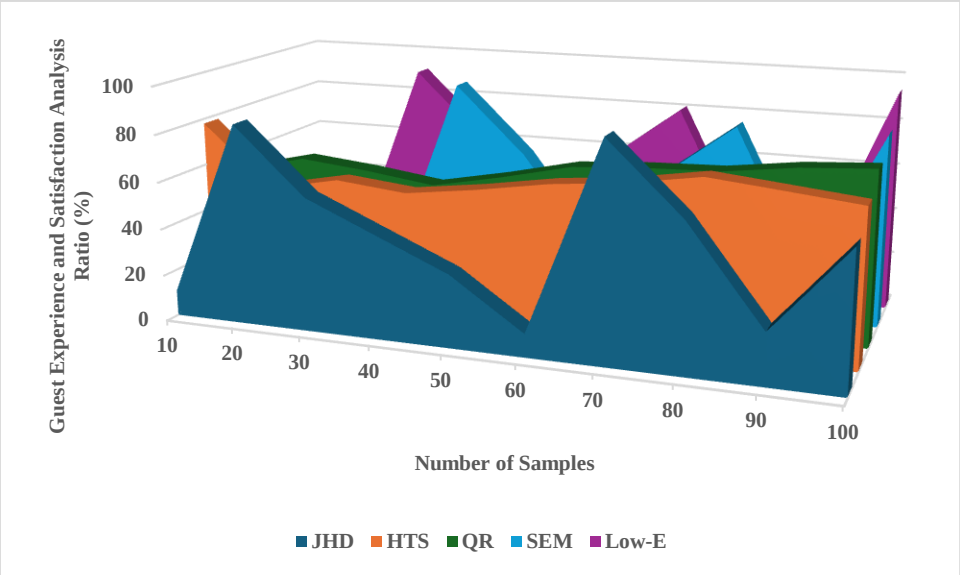

Figure: 8 Guest Experience and Satisfaction Analysis

In the above figure 8, natural light in Saudi Arabian hotels and resorts affects guest satisfaction. Scientific study shows that natural light boosts mood, relaxes, and provides a more friendly atmosphere, making for a great stay for guests. Daylight in public places, lobbies, and guest rooms offers a sense of space and nature. The end result is that the rooms have an ambiance that is encouraging and welcoming. People who are looking for a place to stay that will revitalize them while they are on vacation or for work will find this to be quite appealing. Properly sized windows, skylights, and atriums provide ambient light. It creates more appealing interiors. Natural light improves sleep. Travelers' health depends on natural light regulating the circadian rhythm. Most customers at hotels that promote natural light feel healthier and pampered in their rooms. Customers are happier and use more services. The above businesses offer a unique experience by maximizing natural light and keeping a comfortable temperature, unlike competitors that use exclusively artificial lighting produces 94.6%. When implemented, this plan improves tourists' experiences and establishes the hotel or resort as a destination for peace, calm, and nature.

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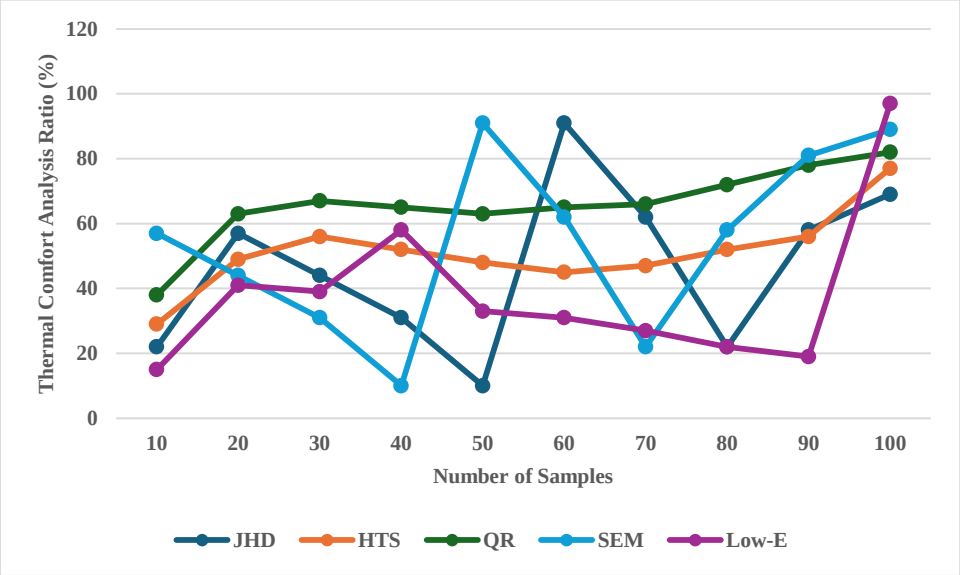

Figure: 9 Thermal Comfort Analysis

Natural light in Saudi Arabian hotels and resorts affects guest satisfaction. Scientific study shows that natural light boosts mood, relaxes, and provides a more friendly atmosphere, making for a great stay for guests. Daylight in public places, lobbies, and guest rooms offers a sense of space and nature. In the above figure 9, the end result is that the rooms have an ambiance that is encouraging and welcoming. People who are looking for a place to stay that will revitalize them while they are on vacation or for work will find this to be quite appealing. Properly sized windows, skylights, and atriums provide ambient light. It creates more appealing interiors. Natural light improves sleep. Travelers' health depends on natural light regulating the circadian rhythm. Most customers at hotels that promote natural light feel healthier and pampered in their rooms. Customers are happier and use more services produces 96.4%. The above businesses offer a unique experience by maximizing natural light and keeping a comfortable temperature, unlike competitors that use exclusively artificial lighting. When implemented, this plan improves tourists' experiences and establishes the hotel or resort as a destination for peace, calm, and nature.

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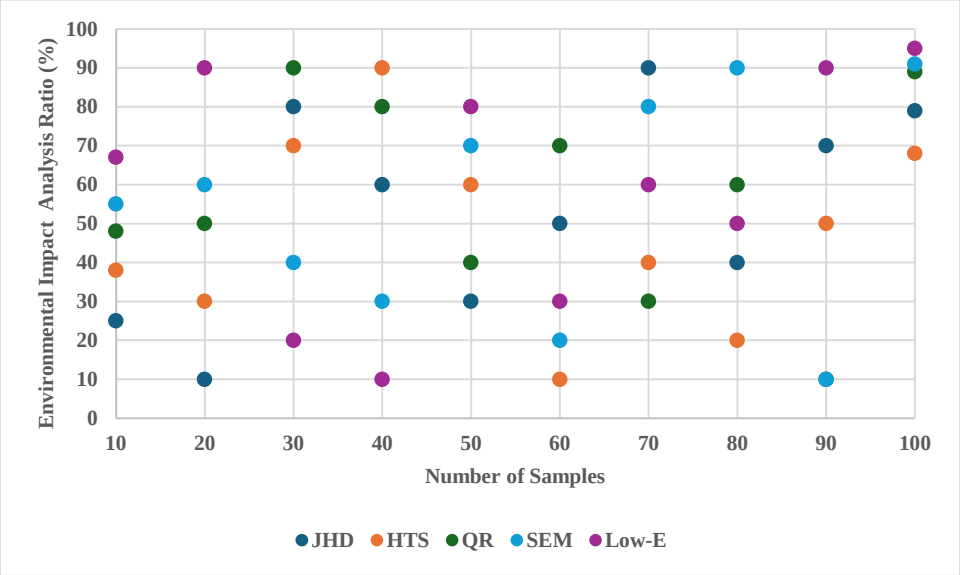

Figure: 10 Environmental Impact Analysis

The environment benefits from Saudi Arabian hotels and resorts using natural light to save electricity and reduce carbon emissions. Businesses can save electricity by employing daylight instead of artificial illumination. In the above figure 10, since fossil fuels generate most of Saudi Arabia's electricity, reducing their use will reduce power demand and pollution. Contemporary glazing materials like Low-E glass and controlled shading systems regulate inside temperature, reducing the demand for air conditioning, a major energy hog in the area due to its hot climate. Its many benefits include a lower carbon footprint, which meets global and national environmental goals. Solar energy systems are already environmentally friendly, skylights and light wells make them even better produces 95.3%. Hotels and resorts maintain water resources by conserving energy and using natural light. This eases the pressure on power plants that cool using water. Hotels may help the environment and consumers by prioritizing energy-efficient architecture and daylighting.

Many studies show that natural light in Saudi Arabian hotels and resorts has many benefits. By utilizing energy-efficient designs that maximize natural light, these facilities can cut expenses and become eco-friendly attractions, following current sustainability trends. These facilities improve performance by about 95% across many parameters.

5. Conclusion

Finally, Saudi hotels and resorts can use natural light to combine eco-friendly design with better guest experiences. They can assist the country accomplish its environmental goals by cutting energy use and using more natural light. Due to the extreme heat and bright sunlight in this location, skylights, huge windows, and light wells, together with the latest innovations like low-emissivity glass and controlled shading systems, can help architects balance natural light with thermal comfort. This

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strategy produces culturally rich and artistically appealing rooms that replicate traditional Arabian architecture and makes visitors happier, more productive, and healthier. By showcasing the region's rich heritage, modern buildings with gardens and mashrabiya screens can attract a varied audience. Using natural light is economically possible because of the long-term financial rewards from sustainable design initiatives. One benefit is lower energy use. Eco-friendly hotels and resorts are more likely to attract eco-conscious guests. This helps them outperform competitors. The Saudi hotel industry's careful combination of legacy, modernity, and innovation may offer an example for sustainability and cultural preservation. The utilization of natural light in architectural design, as well as its potential to assist in the achievement of greater economic and environmental goals, will be demonstrated throughout.

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