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USER SATISFACTION WITH REGENERATIVE ARCHITECTURE PRINCIPLES IN SELECTED RECREATIONAL CENTRES IN LAGOS, NIGERIA

Bukola Adejoke Adewale[1], Lois Adeife Omokanye[2], & Udemezue Chinekwu N.[3]

[1,2,3]*Department of Architecture, College of Science and Technology, Covenant University, Nigeria*

Email: lois.omokanyepgs@stu.cu.edu.ng; phone: +2347081062680

Abstract

Buildings should contribute to and renew their environment rather than drain them, much as plants and animals do when they adapt to their surroundings and participate in maintaining the ecosystem. Therefore, this study aimed to assess user satisfaction and perceptions of regenerative architecture in recreational centres, focusing on how these principles inform user-centred design and promote sustainable development while identifying areas for improvement. The research employed a two-fold approach, commencing with a theoretical study of regenerative architecture, followed by a quantitative method involving the distribution of structured questionnaires. These questionnaires sought to gather information from users within the study area, focusing on their satisfaction and perceptions regarding various aspects of regenerative architecture principles implemented in the recreational centres. A total of 120 questionnaires were distributed to the users of the recreational facilities, and the return rate was 87.5%. Purposive and random sampling techniques were used to select the recreational centres and the respondents respectively. The responses were analysed using a Statistical Package for the Social Sciences (SPSS) software. The study reveals a generally positive perception of regenerative architecture principles in the recreational centres, with users expressing satisfaction in various aspects related to the green spaces, design interaction, cultural expression visual appeal, air quality, and maintenance of the recreational centres.

Keywords: Recreational centre, Regenerative Architecture, Sustainable design, User satisfaction

INTRODUCTION

The construction and operation of buildings have significant negative impacts on the environment, including high energy consumption, water usage, and carbon dioxide emissions (Fahmy, Abdou, & Ghoneem, 2019). This has led to the emergence of the concept of regenerative architecture, which aims to create buildings that have a positive impact on their surroundings and the environment (Ukaegbu & Omoyeni, 2019). Sustainable design practices have been insufficient in addressing the magnitude of environmental deterioration, and regenerative architecture focuses on restoring and healing the environment through a closed-loop system and

considering the interdependence of all ecosystem stakeholders (Prisha, 2022; Naboni & Garcia, 2017).

Recreational centres, as large structures, contribute to the environmental footprint through materials, water, energy, and waste generation (Stinnett, 2013). However, these facilities play a vital role in promoting physical activity, leisure, and community well-being (Tashtoush, Melero, Duarte, & Cruz, 2020). The relationship between people's well-being and the natural environment has been extensively studied, indicating that being in nature positively affects psychological and physical health (Hartig, Mitchelle, De Vries, & Frumkin, 2014; Kondo, Fluehr, McKeon, & Branas, 2018; Russell et al., 2013). Recreation centres can therefore provide opportunities for engaging in physical activities, connecting with nature, and experiencing the benefits of green infrastructure, which enhances human well-being through ecosystem services (Fagerholm, Eilola, & Arki, 2021).

In the context of recreational centres, user satisfaction plays a crucial role in evaluating the success of regenerative architecture initiatives. User satisfaction is determined by how well a facility meets or exceeds customer expectations regarding its attributes (Crompton, 1995); (Omemam et al., 2021). Integrating regenerative design principles into the construction and operation of recreational centres is essential to minimize their negative environmental impact and maximize their positive contribution to human well-being (Bharath, 2019). However, to effectively implement these principles, it is vital to understand user perceptions and satisfaction towards regenerative architecture.

Although previous studies have explored regenerative architecture principles in various domains, including eco-resort design and biophilic design (Kabir, 2016; Bharath, 2019), there is a lack of research applying these principles to the design of recreational centres. The study will draw insights from previous research on regenerative architecture principles and their implementation in different contexts (Kabir, 2016; Bharath, 2019; Fahmy, Abdou, & Ghoneem, 2019). User satisfaction, a key factor in evaluating the quality of a destination or facility, will be examined as it relates to the performance of recreational centres in meeting visitors' expectations (Sıvalıoglu & Berkoz, 2012; Omemam et al., 2021).

To address this research gap, this study aims to investigate user satisfaction with regenerative architecture in selected recreational centres in Lagos, Nigeria. By exploring users' experiences and perspectives, this research seeks to gain insights into the effectiveness of regenerative design in enhancing user satisfaction and identifying areas for improvement. To achieve the aim of this study, the following objectives were adopted:

i. To assess users' perceptions to identify the regenerative architecture principles implemented in the selected recreational centres.
ii. To evaluate user satisfaction with the Regenerative architecture principles of the recreational centres.

Through this study, a comprehensive understanding of the relationship between regenerative architecture and user satisfaction can be obtained, providing valuable insights for future design and development of sustainable and user-centric recreational centres. It will provide insights into how regenerative architecture principles can enhance user experiences, contribute to environmental preservation, and promote a change in basic assumptions in the creation and operation of recreational centres in Lagos, Nigeria. The findings of this research will contribute to the existing knowledge on user perception and satisfaction towards regenerative architecture in the specific context of recreational centres in Nigeria, providing valuable insights for future design and development projects in the region.

The Concept of User Satisfaction

User satisfaction is a critical concept that measures the extent to which an organization's offerings align with user expectations (Sıvalıoglu & Berkoz, 2012). It is influenced by the comparison between customer expectations and perceived product attributes. Meeting or exceeding expectations leads to satisfaction, while falling short results in dissatisfaction (Omemam et al., 2021). To achieve satisfaction, companies must exceed customer expectations and enhance the overall customer experience (Alaina Franklin, 2023; Assignment Point, 2023). The time dimension is also important, as satisfaction is a short-term emotional response to specific service encounters, while perceived service quality is a long-term cognitive evaluation (Ograjenšek & Gal, 2011). In the context of the study on regenerative architecture in recreational centres in Lagos, Nigeria, understanding user perceptions of service quality is crucial for improving facilities and services to meet user needs and enhance satisfaction (Suttikun & Chang, 2016).

Regenerative Architecture

Regenerative architecture is a concept that has evolved to encompass more qualitative implications in the built environment and construction industry. It prioritizes efficiency, conservation, and the active participation of the environment in the design and construction process (Kabir, 2016). Regenerative architecture goes beyond sustainable design by aiming to create buildings that actively contribute to the local ecology and have a net-positive impact (HMC Architects, 2019). This approach involves considering the complete system, drawing inspiration from the natural environment, and utilizing regenerative processes to restore and renew ecosystems (Littman, 2009).

Regenerative Architecture Principles

The fundamental concept underlying regenerative architecture principles is the idea that design should respond to the local biosphere and the specific context of the building site (J.A. Littman, 2009). Various researchers have explored this concept under different names, such as the Guiding Principles of RA, Hannover Principles, Principles of Ecological Design, and Principles of Regenerative Architecture. Each researcher emphasizes the importance of considering the "place" in design (Kabir, 2016).

Littman's set of nine principles in regenerative architecture not only incorporates Todd's Concepts of Ecological Design, Todd's Principles of Ecological Design, and Hannover's Principles but also introduces his own unique principles. These principles are inspired by various closely related disciplines and have the common goal of creating a lasting integration between the human and natural environments (Bharath, 2019); (Kabir, 2016).

a) Whole Systems Design Integration, as a regenerative architecture principle, recognizes the site as a holistic system, taking into account all components and relationships during the design process. It ensures that no species is left unaccounted for, acknowledging the interdependent relationships that exist within the ecosystem. Each element in the design serves multiple functions and fulfils various requirements, exemplifying multifunctional elements. Moreover, the principle considers multiple sources to satisfy specific needs, ensuring redundancy and resilience for the smooth functioning of the system (Bharath, 2019).
b) Integration into the Landscape: This principle highlights the importance of thorough site analysis and the integration of the design with the natural environment. For instance, in building upwards, architects consider vertical expansion to preserve the surrounding landscape. Maximizing the use of rooftop gardens further enhances the harmony between habitation and nature. Incorporation of the local landscape elements, such as trees and water bodies, ensures a seamless blend with the surroundings. The design is influenced by natural elements like sunlight, wind patterns, and topography. Conservation of the unique features of the site, such as heritage structures or natural landmarks, is a priority. By viewing landscapes as interconnected systems, designers take a holistic approach to create regenerative spaces. Utilizing shapes and forms found in nature, like curves and flowing lines, further reinforces the design's connection with the environment (Kabir, 2016).
c) Principle of Bold Ecology: This principle, focusing on ecological systems and achieving a net-positive energy outcome, can be exemplified through real-life examples of sustainable design practices. Incorporating natural light and integrating natural airflow into the building's design can minimize the need for artificial lighting and ventilation, thus reducing energy consumption. Design features that operate without active mechanical systems, such as passive solar heating and cooling techniques, contribute to energy efficiency. Additionally, the site's available resources can be harnessed through practices like rainwater collection, treatment, and reuse, further promoting sustainability. Utilizing renewable energy sources such as solar power, wind energy, and biogas production can help the facility generate more energy than it consumes. Emphasizing human-powered transportation methods and relying on the functioning of natural systems can reduce the facility's ecological footprint while promoting a regenerative approach to design (Bharath, 2019).
d) This principle emphasizes maximizing the beneficial impact of each material and area included in the design, considering the potential of the system. It aims to achieve equilibrium within the system and recognizes that constraints placed on the site can influence its evolution (Kabir, 2016). For instance, real-life examples of this principle in action include

the limited use of impermeable site covering, which allows for better water infiltration and reduces stormwater runoff. Additionally, the design may incorporate strategies to reduce reliance on mechanical systems, such as passive heating and cooling techniques to optimize energy efficiency. Furthermore, the integration of water storage and treatment facilities within the site enables efficient water management and conservation. Lastly, regenerative architecture principles may involve design elements that resonate with the local environment, using indigenous materials and architectural styles to enhance the building's harmony with its surroundings.

e) Principle of Concentration: This principle, as emphasized by Bharath (2019), highlights the importance of spatial interactions between elements and their strategic placement within the site, leading to real-life examples such as a positive influence on the building's footprint, the exclusion of unnecessary or repetitive spaces, and optimal effects on the functioning of the system. Each area is carefully designed to interact with its neighbors, resulting in a harmonious and efficient layout that optimizes functionality and potential. Furthermore, the application of this principle ensures that every module within the design is individually optimized for optimal performance, contributing to a cohesive and well-integrated regenerative architecture
f) Principle of Intelligent Construction: This principle focuses on construction methods and materials, suggesting the use of both natural and man-made approaches while emphasizing a thorough examination of materials for durability and compatibility (Kabir, 2016). Examples of such materials include environmentally safe options, materials that can decompose naturally, those procured from the local region, and elements from nature like rocks and water features. Additionally, the adoption of recycled materials and the usage of recyclable materials further align with this regenerative approach, communicating the intended design and revealing valuable information about the environment and systems.
g) Principle of Community: This principle emphasizes the interconnectedness and autonomy of entities within a community, highlighting their relationships and interactions. Instead of solely focusing on entities' size, it encourages collaboration and cooperation among them. For instance, in a regenerative neighborhood, residents actively engage with local businesses, schools, and public spaces, fostering a strong sense of community and shared responsibility. This interconnectedness promotes the freedom of entities from over-reliance on others, creating a self-sustaining ecosystem where each entity contributes to the overall well-being and resilience of the community (Bharath, 2019).
h) Experience of Place: This principle emphasizes the uniqueness and specific qualities of the location. The design should create an atmosphere and experience that inspires and engages the community's users, guided by established concepts and tactics. For instance, incorporating landscape components that complement each other, using locally sourced building materials, and strategically positioning the building to enhance the user's experience are essential considerations. Appropriate site zoning ensures the functionality and harmony of the space, while aesthetically pleasing elements contribute to a positive ambiance.

Moreover, active engagement with the community throughout the design process fosters a sense of ownership and connection to space (Kabir, 2016).

i) Principle of Culture: This principle focuses on the cultural identity of the location and its components. It recognizes that cultural organizations are integral parts of the location and should be honoured and embraced during the planning phase. Cultural expression is an essential aspect of the design process, evident in real-life examples such as the incorporation of indigenous elements, which celebrate the region's rich heritage. Additionally, the inclusion of elements that reflect the local culture creates a sense of belonging and connection for visitors. Furthermore, regenerative architecture principles can extend to providing habitat for local species, promoting biodiversity, and contributing to the ecological balance of the area. Lastly, by considering the beneficial influence of the design on the surrounding environment, regenerative architecture can positively impact the community and foster sustainable development (Bharath, 2019).

Each of these principles contributes to the overarching concept of regenerative architecture, incorporating elements from various disciplines and aiming to merge the human and natural environments in a sustainable and harmonious way.

Regenerative Architecture Principles and User Satisfaction

In the realm of architecture and design, McKinney (2002) further highlights that users' expectations are confirmed when product or service performance matches their prior expectations. However, negative disconfirmation occurs when the performance falls below their expectations, leading to dissatisfaction. Menadue, Soebarto, and Williamson (2013) found that green buildings provided slightly higher satisfaction with thermal comfort and perceived health but lower satisfaction with lighting, noise, and self-assessed productivity. These findings emphasize the importance of considering users' perceptions and satisfaction when evaluating the impact of regenerative architecture principles in recreational centres. By understanding how users perceive and evaluate the design variations, it becomes possible to enhance user satisfaction and create more sustainable and inclusive spaces (Mohammadpour et al., 2015). The study of user satisfaction in the context of regenerative architecture aligns with the Sustainable Development Goals, particularly Goal 11, which focuses on creating inclusive, safe, resilient, and sustainable cities and communities (UN, 2015). Additionally, considering the influence of strategic planning on consumer satisfaction, it becomes evident that the implementation of regenerative architecture principles can have a significant impact on users' overall satisfaction with recreational centres (Greenwell et al., 2002). A study (James, 2011) conducted also found that green buildings can contribute to user satisfaction in physical and perceptual terms.

Study Area

This study focuses on Lekki Phase 2/Eti-Osa Local Government Area (LGA) (see Figure 1), which is situated in the southern region of Lagos, Nigeria (Climate Change Network Nigeria,

2021). It is one of the 37 LGAs located in Lagos state and shares its northern boundary with the Lagoon and its southern boundary with the Atlantic Ocean. The LGA's eastern boundary is shared with Ibeju-Lekki LGA, while its western boundary is shared with Lagos Island LGA (Climate Change Network Nigeria, 2021).

Figure 1: Map of Lagos showing the study area
Source: Google maps (2023)

The selection of this area as the study's focus is due to its prominence as one of the largest urban developments in Nigeria and its status as the location with the highest number of recreational centres in the country.

RESEARCH METHODOLOGY

The research methodology employed in this study followed a quantitative approach to achieve the research objectives. The population consisted of ten recreational centres in Lagos State, Nigeria, selected based on international standards retrieved from Nigeria Business Web on Recreational Centres. To identify the sample size of the recreational centres, a purposive sampling technique was utilized, aiming to select information-rich cases related to recreational facilities. The selection criteria considered factors such as location, size, type, and overall building standard of the centres. From all available recreational centres in the study area, ten were purposefully chosen, meeting international standards set by various organizations and governing bodies, focusing on safety, accessibility, functionality, environmental sustainability, amenities and services, maintenance and cleanliness, multi-functionality, compliance with local regulations, and overall user experience, with guidance from organizations like the International Association for

Sports and Leisure Facilities (IAKS) and the International Organization for Standardization (ISO). The subsequent stage involved narrowing the selection to recreational centres within the Local Government Area of Eti-Osa, from which three centres were randomly chosen as the final sample size. The research also employed a mixed recreational type sampling strategy, considering both outdoor and indoor facilities. This multi-stage selection process ensured a representative and relevant sample for the study's investigation.

Data collection for this study involved administering structured, closed-ended questionnaires to both recreational centre visitors and staff. The questionnaires were specifically designed to gather quantitative data related to visitors' satisfaction with the regenerative architecture principles adopted in the recreational centres. The sample size of the respondents was determined through convenient sampling and ensured an adequate representation of visitors' perceptions and experiences with the regenerative architecture principles in the chosen recreational centres. In total, 120 questionnaires were distributed across the three selected recreational centres, namely Twin Waters (46), Upbeat Recreation Centre (34), and Landmark Centre (40).

The survey was conducted during the period from December 20th, 2022, to January 7th, 2023, with a primary focus on both weekends and weekdays during the December holiday season. This decision was made strategically to capture responses from a diverse range of visitors who typically frequent the recreational centres during their leisure time. The holiday season was expected to attract a broader spectrum of visitors, including families, students, and individuals seeking recreational activities. This approach aimed to gain a comprehensive understanding of user perspectives and preferences during peak usage of the recreational centres. It is acknowledged that the survey administration during the holiday season and on weekdays may have influenced the sample composition, and this consideration should be considered when interpreting the findings.

Twin Waters is Nigeria's premier entertainment facility, offering cutting-edge experiences. It houses Rufus and Bee, the country's first ultimate gaming arcade, along with upscale stores, a cinema, fine dining restaurants, event suites, rooftop bar, and breath-taking views of the Atlantic Ocean. The arcade features over 100 games, sports area, café, basketball courts, and bowling lanes, all complemented by eco-friendly features, valet parking, and accessibility for people with disabilities.

Upbeat Recreation Centre in Lagos, Nigeria, is home to the first trampoline park on the continent. Opened in December 2017, this state-of-the-art sports and recreation facility aims to cater to the needs of Lagos' active and youthful population, offering a blend of retail and leisure experiences. Positioned as a modern and exciting leisure project, it is expected to have a positive impact on Nigerian families, children, communities, and the wider West African region.

The Landmark Centre is a modern mixed-use building situated on Victoria Island, Lagos, offering stunning views of the Atlantic Ocean. It embodies Landmark Africa's "Business, Leisure,

Lifestyle" approach and aims to become Lagos' equivalent of iconic centres like Rockefeller Centre and Canary Wharf. With its attractive design and successful 11-year presence, the building has become a well-known destination and attracts visitors with its captivating exterior.

"X" represents the presence of a specific regenerative Principle in each recreational facility. For example, Twin Waters incorporates whole systems design integration, integration into the landscape, intelligent limits, intelligent construction, experience of place, and culture principles. Upbeat Recreation Centre includes whole systems design integration, principle of bold ecology, principle of concentration, principle of intelligent construction, community, experience of place, and culture principles. Landmark Centre integrates integration into the landscape, principle of bold ecology, principle of concentration, principle of intelligent construction, community, experience of place, and culture principles.

Table 1: Showing the Regenerative Architecture Principles adopted in each of the selected recreational centres

Recreational facility	**Whole Systems Design Integration**	**Integration into the Landscape**	**Principle of Bold Ecology**	**Principle of Intelligent Limits**	**Principle of Concentration**	**Principle of Intelligent Construction**	**Principle of Community**	**Experience of Place**	**Principle of Culture**
Twin Waters	X	X	X	X	X	X		X	X
Upbeat Recreation Centre	X	X	X	X	X	X	X	X	
Landmark Centre		X	X	X	X	X	X	X	

The collected data were subjected to descriptive statistical analysis. The results were presented using tables, texts, to provide a comprehensive overview of the findings. To ensure validity and reliability, a standardized format was used for the questionnaire administration. The research methodology has certain limitations, including the focus on a specific geographical area (Lagos state) and the selected recreational centres. However, the use of purposive and random sampling techniques was aimed at minimizing bias, and enhancing the representation of the target population.

RESULTS AND DISCUSSION

The questionnaire survey was designed with best practice principles and was divided into three sections. The questions were derived from existing literature on regenerative architecture principles (Kabir, 2016), and comprised of questions relating to users' perception and satisfaction with the principles applied in their recreational facilities. A total of 105 questionnaires were distributed to respondents in the survey area.

Socio-economic Characteristics

This data provides insights into the characteristics of respondents who participated in the survey, including their gender, age, education, and employment status. It also highlights the recreational facility most frequently visited by respondents and the reasons for their visits.

Table 2: Characteristics of respondents

Respondents' characteristics variable	Categories	Frequency	Percentages
Sex of respondent	Male	49	46.7
	female	56	53.3
Age of Respondent	Less than 20 years	28	26.7
	20-29 years	57	54.3
	30-39 years	11	10.5
	40-49 years	6	5.7
	More than 50 years	3	2.9
Employment status	Student	51	48.6
	Unemployed	1	1
	Self employed	26	24.8
	Private employment	18	17.1
	Public employment	8	7.6
Recreational facility	Twin waters	46	43.8
	Upbeat Recreation Centre	31	29.5
	Landmark centre	28	26.7
Highest level of education	No formal Education	-	-
	Primary education	2	1.9
	WASSCE	30	28.6
	Bsc/ OND/ HND	58	55.2
	MSc/ MBA	14	13.3
	PhD	1	1.0
How often do you visit this recreational facility	Never	-	-
	Daily	25	23.8
	Rarely	23	21.9
	Occasionally	32	30.5
	Frequently	25	23.8
Why do you visit this Recreational Facility	Recreational purposes	62	59.04
	Employee	39	40.96

Source: Fieldwork, 2023

Table 2 shows the respondents who participated in the survey on the recreational facilities studied. The data reveals a balanced gender representation, with 46.7% male and 53.3% female respondents. This indicates the importance of considering the preferences and needs of both male and female visitors. Most respondents were in the age range of 20-29 years (54.3%), suggesting that the recreational facilities surveyed may be more popular among younger adults and college

students. It is essential to tailor recreational activities and amenities to cater to this age group. Furthermore, the employment status of respondents shows that 48.6% were students, emphasizing the need to provide youth and student-friendly programs and discounts. The most frequently visited recreational facilities in order were Twin Waters (43.8%), Upbeat Recreation Centre (29.5%), and Landmark centre (26.7%). In terms of education, many respondents had higher education qualifications such as a bachelor's degree or diploma (55.2%), while a notable percentage held master's degrees or MBA qualifications (13.3%). Respondents visited the recreational facility for either recreational purposes (59.04%) or employee-related reasons (40.96%).

User Perception of Respondents

Table 3 presents the results of a survey conducted to measure the respondents' perception of various aspects of a recreational centre. The variables are classified according to the level of agreement expressed by the respondents on a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." Based on the objective (i) of the study, which aims to identify regenerative architecture principles adopted in the selected recreational centres and examine users' perception regarding these principles, the analysis of the data provides insights into the users' perspectives on various aspects of regenerative architecture applied in the recreational facilities studied.

Table 3: Showing the level of agreement or disagreement with the Regenerative Architecture Principles applied in the Recreational centres

Variables	Classification					Total (%)	Mean	Std. Deviation
	Strongly Disagree (%)	Disagree (%)	Not sure (%)	Agree (%)	Strongly Agree (%)			
The green spaces (grass, tress etc.) adequate in the recreational centre?	-	19.2	13.5	54.8	12.4	99	3.61	0.939
The design of the recreational centre allows me to interact with my community?	1.0	10.5	7.6	68.6	12.4	100	3.81	0.822
The recreational centre's cultural expression makes me feel a sense of place?	2.9	13.3	18.1	48.6	17.1	100	3.64	1.011
Is natural lighting adequate throughout the recreational centre?	1.0	6.7	11.4	61.0	20.0	100	3.92	0.817
Is there a feeling of connectedness to the environment and nature when I am in the recreational centre?	1.9	9.5	16.2	44.8	27.6	100	3.87	0.991

Is the recreational centre visually appealing?	1.0	6.7	5.7	47.6	39.0	100	4.17	0.882
The recreational centre has various types of plants and vegetation?	2.9	16.2	17.1	47.6	15.2	99	3.57	1.031
The air feels cleaner in the recreational centre?	-	16.2	21.9	54.3	7.6	100	3.53	0.0.85656
Was the design of the recreational centre inspired by nature?	11.4	23.8	20.0	36.2	8.6	100	3.07	1.187
Is natural ventilation adequate?	1.9	12.4	17.1	54.3	14.3	100	3.67	0.937
The recreational centre is properly maintained	1.0	7.6	3.8	54.3	33.3	100	4.11	0.870
The recreational centre is harmful to the environment	50.5	31.4	2.9	10.5	3.8	99	1.85	1.139

Source: Fieldwork, 2023

The analysis of Table 3 reveals varying perceptions among respondents regarding the regenerative architecture principles applied in the recreational centre. Several aspects received positive feedback, with relatively low standard deviations, indicating more consistent agreement among respondents. These aspects include community interaction, visual appeal, air quality, and proper maintenance. Users expressed satisfaction with the design's ability to facilitate community engagement and its aesthetic appeal. Additionally, the majority perceived the recreational centre's air quality to be clean, and there was overwhelming agreement that the facilities were well-maintained.

However, certain aspects displayed higher standard deviations, reflecting greater variability in responses and uncertainty in perception. For instance, respondents had mixed views on the adequacy of green spaces, cultural expression, nature-inspired design, and the feeling of connectedness to nature. The relatively high standard deviations in these areas suggest that some visitors strongly agreed with these principles, while others expressed uncertainty or disagreement. This variation underscores the need for improvement and further attention to these aspects to enhance user experience and satisfaction. Moreover, the analysis indicates that the recreational centre's natural lighting and the diversity of vegetation received moderate levels of satisfaction, with standard deviations suggesting a more consistent perception among respondents compared to the aspects with higher variability. Nonetheless, there is still room for improvement and fine-tuning to better meet users' expectations in these areas.

Table 4 shows the level of perception scale used in the study. Its use in the study was applied thus:

Not Perceived: The regenerative architecture principle is not mentioned or perceived by the respondents in the survey.

Low Perception: The regenerative architecture principle is mentioned or perceived by the respondents, but the level of awareness or understanding is minimal or vague.

Moderate Perception: The regenerative architecture principle is somewhat acknowledged and *understood by the respondents, but there is room for improvement in their perception.*

High Perception: The regenerative architecture principle is well-recognized and understood by the respondents, indicating a clear awareness and comprehension.

Strong Perception: The regenerative architecture principle is highly recognized, deeply understood, and well-appreciated by the respondents, demonstrating a strong and positive perception.

Table 4: Level of Perception Scale

Scale	Inference: Level of Perception
1	Not Perceived
2	Low Perception
3	Moderate Perception
4	High Perception
5	Strong Perception

By utilizing the Level of Perception Scale presented in Table 4, the study gained valuable insights into users' understanding and awareness of regenerative architecture principles in the context of recreational centres. This scale allowed for differentiation between various aspects' perceptions and shed light on the importance of creating spaces that provide a positive and enriching experience for users.

Table 5 presents a summary of respondents' perceptions on various aspects related to regenerative architecture principles in the recreational centre. The mean scores for each variable are compared to the inference scale to assess the level of perception. The study reveals that the majority of respondents have a high perception of various regenerative architecture elements in the recreational centre. Most aspects, including green spaces, community interaction, cultural expression, natural lighting, connectedness to nature, visual appeal, plants and vegetation, and air quality, are perceived as being at a high level. Additionally, respondents highly perceive the recreational centre's maintenance and the adequacy of natural ventilation. However, it's important to note that the design inspired by nature received a moderate perception, indicating room for improvement in this area. On the other hand, there is a low perception regarding the recreational centre's potential harm to the environment, with most respondents expressing a low perception of such impact.

Table 5: Level of Inference

Variables	Mean Score (5)	Mean (5)	Inference
The green spaces (grass, tress etc.) adequate in the recreational centre?	3.61	4	High Perception
The design of the recreational centre allows me to interact with my community?	3.81	4	High Perception
The recreational centre's cultural expression makes me feel a sense of place?	3.64	4	High Perception
Is natural lighting adequate throughout the recreational centre?	3.92	4	High Perception
Is there a feeling of connectedness to the environment and nature when I am in the recreational centre?	3.87	4	High Perception
Is the recreational centre visually appealing?	4.17	4	High Perception
The recreational centre has various types of plants and vegetation?	3.57	4	High Perception
The air feels cleaner in the recreational centre?	3.53	4	High Perception
Was the design of the recreational centre inspired by nature?	3.07	3	Moderate Perception
Is natural ventilation adequate?	3.67	4	High Perception
The recreational centre is properly maintained	4.11	4	High Perception
The recreational centre is harmful to the environment	1.85	2	Low Perception

Source: Fieldwork, 2023

Finally, the study shows that visitors have a positive perception of the regenerative architecture principles applied in the recreational centre. Many aspects are perceived as being at a high level, except for the design inspired by nature, which receives a moderate perception. Overall, the findings highlight the success of the implemented regenerative strategies in creating a positive experience for visitors.

Satisfaction Level of Respondents

Table 6 shows the results of a survey conducted on various variables related to satisfaction with various aspects of a living space. The variables are grouped into five categories ranging from "Very Unsatisfied" to "Very Satisfied". Overall, 100% of the respondents have given their satisfaction levels for each variable.

Table 6: Showing the level of satisfaction or dissatisfaction with the Regenerative Architecture Principles applied in the Recreational centres

Variables	Classification					Mean	Std. Deviation
	Very Unsatisfied (%)	Unsatisfied (%)	Neutral (%)	Satisfied (%)	Very Satisfied (%)		
Satisfaction with Cultural Expression	2.9	6.7	22.9	57.1	8.6	3.63	0.852
Satisfaction with water supply	1.0	7.6	8.6	64.8	18.1	3.91	0.810
Satisfaction with the green design features	1.0	5.7	6.7	59.0	27.6	4.07	0.812
Satisfaction with the interaction with green features	1.0	14.3	14.3	63.8	6.7	3.61	0.849
Satisfaction with space utilisation	2.9	6.7	9.5	67.6	13.3	3.82	0.852
Satisfaction with air quality	-	5.7	13.3	57.1	23.8	3.99	0.778
Comfort	-	-	7.6	62.9	29.5	4.22	0.571
Satisfaction with energy provision	-	5.7	21.0	49.5	23.8	3.91	0.822
Satisfaction with performance	-	5.8	8.6	66.7	19.0	3.99	0.714
Satisfaction with Visual appearance	1.9	9.5	10.5	55.2	22.9	3.88	0.937

Source: Fieldwork, 2023

Table 6 shows the satisfaction levels of respondents on various aspects of the recreational centre. Many respondents reported being satisfied with cultural expression, water supply, green design features, interaction with green features, space utilization, air quality, comfort, energy provision, and performance. However, there were varying levels of neutrality, dissatisfaction, and very unsatisfied responses across these categories. Notably, a significant portion of respondents expressed dissatisfaction with the visual appearance of the recreational centre. Overall, these findings highlight areas where improvements can be made to enhance user satisfaction, particularly in terms of visual appeal.

Table 7 provides the ranking of respondents' satisfaction or dissatisfaction levels with various regenerative architecture principles applied in the recreational centres. The following is an analysis of the findings:

Comfort: The regenerative architecture principle related to comfort received the highest ranking, with a mean satisfaction score of 4.22. This indicates that respondents highly value and are most satisfied with the comfort level provided by the recreational centre.

Satisfaction with the Green Design Features: The green design features received the second-highest ranking, with a mean satisfaction score of 4.07. This suggests that respondents are generally satisfied with the green design elements incorporated in the recreational centre.

Satisfaction with Air Quality and Satisfaction with Performance: Both aspects received the third-highest ranking, with a mean satisfaction score of 3.99 each. This indicates that respondents are moderately satisfied with the air quality and the overall performance of the recreational centre.

Satisfaction with Water Supply and Satisfaction with Energy Provision: Both aspects received the fifth-highest ranking, with a mean satisfaction score of 3.91 each. This suggests a moderate level of satisfaction with both the water supply and the energy provision in the recreational centre.

Satisfaction with Space Utilization: The aspect of space utilization received the eighth-highest ranking, with a mean satisfaction score of 3.82. This indicates a moderate level of satisfaction with how the space is utilized in the recreational centre.

Satisfaction with Visual Appearance: The visual appearance received the seventh-highest ranking, with a mean satisfaction score of 3.88. This suggests a moderate level of satisfaction with the overall visual appeal of the recreational centre.

Satisfaction with Cultural Expression: Cultural expression received the ninth-highest ranking, with a mean satisfaction score of 3.63. This indicates a neutral perception or moderate satisfaction with the cultural expression elements in the recreational centre.

Satisfaction with the Interaction with Green Features: The interaction with green features received the tenth-highest ranking, with a mean satisfaction score of 3.61. This suggests a moderate level of satisfaction or some room for improvement in facilitating interaction with green elements.

Table 7: Showing the ranking of respondents' satisfaction or dissatisfaction level with the Regenerative Architecture Principles applied in the Recreational centres

Variables	Mean	Ranking
Satisfaction with Cultural Expression	3.63	9th
Satisfaction with water supply	3.91	5th
Satisfaction with the green design features	4.07	2nd
Satisfaction with the interaction with green features	3.61	10th
Satisfaction with space utilisation	3.82	8th
Satisfaction with air quality	3.99	3rd
Comfort	4.22	1st
Satisfaction with energy provision	3.91	5th
Satisfaction with performance	3.99	3rd
Satisfaction with Visual appearance	3.88	7th

Source: Fieldwork, 2023

In conclusion, the analysis highlights that respondents were highly satisfied with the comfort provided by the recreational centre, and they showed positive perceptions of the green design features, air quality, and overall performance. While there is moderate satisfaction with the water supply, energy provision, space utilization, and visual appearance, there is room for improvement in enhancing cultural expression and the interaction with green features to further elevate user satisfaction in the recreational centre.

DISCUSSION

User satisfaction is crucial in evaluating architectural designs, reflecting how well they meet users' needs and preferences (Sıvalıoglu & Berkoz, 2012). The findings of this study reveal valuable insights into users' perceptions and highlight areas of strength and opportunities for improvement.

In summary, the results suggest that while certain regenerative architecture principles were well-received and perceived positively by users, others exhibited more varied perceptions, leading to uncertainty in overall satisfaction. To create more sustainable and inclusive spaces, it is essential to consider users' perceptions and preferences when implementing regenerative architecture principles in recreational centres. By addressing areas of concern and enhancing aspects that users value most, the recreational centre can strive towards meeting the Sustainable Development Goals, particularly Goal 11, and significantly impact user satisfaction.

The mean ranking of variables reveals that Comfort emerged as the highest-ranked principle, with respondents expressing high satisfaction levels with the comfort provided by the recreational centre. This finding aligns with the literature on user satisfaction in green buildings, which emphasizes the importance of thermal comfort and well-being (James, 2011; Menadue et al., 2013). The prioritization of comfort underscores the significance of creating spaces that promote a positive and comfortable experience for users, contributing to overall satisfaction with the recreational centre. The green design features received the second-highest ranking, indicating that respondents generally find satisfaction with the incorporation of green elements in the recreational centre. This finding resonates with the concept of regenerative architecture, which emphasizes the integration of natural elements into the built environment to enhance sustainability and human well-being (HMC Architects, 2019; Kabir, 2016). The positive perception of green design features suggests that users appreciate and value the efforts made to create a more environmentally friendly and aesthetically appealing recreational centre.

The aspects of air quality and overall performance of the recreational centre both received the third-highest ranking. This suggests a moderate level of satisfaction with these factors. The importance of air quality in indoor environments and its impact on occupants' health and comfort are well-documented in the literature (Menadue et al., 2013). The findings indicate that the recreational centre has managed to provide a satisfactory level of air quality, contributing to user satisfaction. Additionally, the positive perception of the centre's overall performance underscores

the significance of a holistic approach to regenerative architecture, where all elements collectively contribute to users' positive experience. The aspects of water supply and energy provision both received the fifth-highest ranking, indicating a moderate level of satisfaction with these services. These findings are in line with the principle of Intelligent Limits in regenerative architecture, which emphasizes maximizing the benefits of each material and resource used in the design (Kabir, 2016). Ensuring a sustainable and efficient use of water and energy resources is essential in creating regenerative spaces that align with environmental conservation goals (HMC Architects, 2019).

While the recreational centre received moderate satisfaction scores for space utilization and visual appearance, there is room for improvement in these areas to further enhance user experience. The concept of Integration into the Landscape in regenerative architecture underscores the significance of site-specific considerations and harmonious integration with the natural environment (Kabir, 2016). Focusing on optimizing space utilization and improving visual aesthetics can contribute to a more satisfying and enriching experience for visitors (Ferkey Builders Inc, 2022). Cultural expression and interaction with green features received lower satisfaction scores, indicating the need for attention and improvement in these aspects. Emphasizing the Principle of Culture in regenerative architecture, which values the cultural identity and context of the location, can lead to more inclusive and engaging recreational centres (Bharath, 2019). Additionally, enhancing the interaction with green features can promote a stronger connection with nature, aligning with the Principle of Bold Ecology and creating a more regenerative and sustainable environment (Bharath, 2019).

The findings from this study align with existing literature on regenerative architecture, highlighting the importance of holistic design integration, site-specific considerations, and user-centred approaches to create successful and sustainable built environments. Greenwell et al. (2002) emphasize the influence of strategic planning on consumer satisfaction, suggesting that the implementation of regenerative architecture principles can positively impact users' overall satisfaction with recreational centres. Other studies (James, 2011; McKinney, 2002; Menadue et al., 2013) further support the significance of user satisfaction in green buildings and architectural design, emphasizing its role in enhancing thermal comfort, health perception, and overall well-being.

Finally, the analysis highlights that the recreational centre has effectively addressed key aspects such as comfort, green design features, air quality, and overall performance, leading to high satisfaction levels among users. However, there is scope for improvement in areas such as space utilization, visual appearance, cultural expression, and interaction with green features to elevate user satisfaction further. By considering user perceptions and preferences, and aligning with the principles of regenerative architecture, the recreational centre can create a more sustainable, inclusive, and enriching environment for its visitors. The findings from this study contribute to the existing literature on regenerative architecture and user satisfaction in the context of recreational centres, providing valuable insights for future design and development endeavours.

While the findings provide valuable insights, it is important to acknowledge the study's limitations. The data in the study focused on a specific recreational centre and may not fully capture the diversity of perspectives in different regions in Nigeria. Future research could expand the scope and explore how regenerative architecture influences user satisfaction in recreational centres.

CONCLUSION

This study on user perception and satisfaction towards regenerative architecture principles in selected recreational centres provides valuable insights for the design, maintenance, and management of such spaces. The findings indicated that while certain principles, such as comfort and green design features, were well-received and led to high satisfaction levels, others showed more varied perceptions, leading to uncertainty in overall satisfaction. To create more sustainable and inclusive spaces, it is crucial to consider users' perceptions and preferences when implementing regenerative architecture principles. By addressing areas of concern and enhancing aspects that users value most, the recreational centre can strive towards meeting the Sustainable Development Goals, particularly Goal 11, and significantly impacting user satisfaction. The findings provide valuable insights for future design and development endeavours, contributing to the advancement of regenerative architecture principles in recreational centres. The study recommends a focus on optimizing space utilization and enhancing visual aesthetics. Site-specific design considerations and thoughtful integration with the surrounding landscape can contribute to a more captivating and harmonious environment, emphasize cultural expression through design elements that reflect the local culture and heritage and create spaces that encourage interaction with green features, such as community gardens or nature-inspired play areas, to foster a deeper connection to the environment.

Given the concern regarding the recreational centre's environmental impact, it is crucial to implement measures to reduce its negative effects on the environment. Adopting sustainable building practices, such as using eco-friendly construction materials, incorporating energy-efficient systems, and implementing waste reduction strategies. Employing green building certifications, such as LEED (Leadership in Energy and Environmental Design), can help ensure the recreational centre meets environmental performance standards. It is therefore essential to acknowledge the study's limitations, such as the specific context of the three surveyed recreational centres. Future research should aim to broaden the scope and sample size to enhance the generalizability of the findings. By understanding user perceptions and preferences, practitioners and policymakers can further enhance the quality and effectiveness of recreational centres while fostering regenerative and user-friendly environments.

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