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Biophilic Architecture: A Sustainable Healing Strategy in Rehabilitation Centers in the Niger Delta Region of Nigeria

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Abstract

This research analyzes the potential of Biophilic design as a sustainable healing technique in rehabilitation centers situated in the Niger Delta region of Nigeria. Drawing from the rich biodiversity and cultural past of the region, Biophilic design concepts are investigated as a technique to boost the physical and mental well-being of patients undergoing rehabilitation. By integrating natural components and patterns into the constructed environment, rehabilitation institutions can provide therapeutic places favorable to healing and recovery. In the context of rehabilitation institutions, adopting Biophilic design concepts can provide several benefits to patients, including stress reduction, enhanced mood, and speedier recovery. This paper presents strategies for applying Biophilic design in the Niger Delta's rehabilitation centers and examines the socio-environmental benefits of such an approach.

Keywords: Biophilic Architecture, sustainable development, Niger delta, rehabilitation center, natural light

1. Introduction

A rehabilitation center is an institution that provides specialized care and support to persons recuperating from physical injuries, diseases, substance misuse disorders, or mental health conditions. It includes comprehensive treatment programs targeted at fostering recovery, restoring function, and enhancing the quality of life for those with impairments or health difficulties (National Institute on Drug Abuse, 2020). These facilities provide a range of treatments, including medical care, therapy, counseling, and vocational training, adapted to the unique requirements of each patient (Substance Abuse and Mental Health treatments Administration, 2021).

Biophilic Architecture is anchored on the concept of Biophilia, which claims that humans have an inbuilt connection to nature and benefit from exposure to natural elements (Kellert et al., 2008). By using Biophilic design approaches such as natural light, views of nature, indoor plants, and natural materials. Rehabilitation clinics can create environments that facilitate healing, reduce stress, and improve patient outcomes.

Rehabilitation centers in the Niger Delta region serve a critical role in aiding individuals suffering from numerous health issues, including physical injuries, substance misuse, and mental health illnesses. The Architectural environment of these facilities can dramatically affect patients' well-being and rehabilitation outcomes (Kotler, 2018). However, traditional hospital designs often disregard the value of connecting patients with nature and sometimes fail to meet the psychological and emotional requirements of patients, which can hamper the healing process. In contrast, Biophilic Architecture offers a sustainable approach to rehabilitation center design by incorporating natural components such as flora, water features, and natural light. This research analyzes the significance of Biophilic Architecture in the context of rehabilitation institutions in the Niger Delta and its potential to promote holistic recovery and well-being.

The integration of nature into the built environment has attracted substantial attention in recent years due to its

potential to benefit human health and well-being (Browning et al, 2014). Biophilic Architecture, which tries to integrate natural components and principles into Architectural design, offers a promising way to generating healing environments, notably in healthcare institutions such as rehabilitation centers. Rehabilitation centers serve a key role in aiding those recovering from accidents, diseases, or impairments, and the design of these facilities can greatly impact the rehabilitation process and outcomes. Research has demonstrated that Biophilic components in hospital environments can have several positive effects on patients, staff, and visitors. For example, access to natural light has been associated to shorter healing rates and reduced pain medication used among patients (Ulrich, 1984). Views of nature can help reduce stress and anxiety levels while indoor plants can enhance air quality and provide a more welcome and peaceful ambiance (Heschong, 2003). Additionally, Biophilic design has been demonstrated to boost staff satisfaction, productivity, and overall well-being (Largo-Wight et al., 2011).

Despite the increased interest in Biophilic Architecture, there is still a need for empirical study to determine its effectiveness in rehabilitation centers specifically. Existing studies have generally focused on healthcare settings such as hospitals and clinics, with less research undertaken in rehabilitation settings. Furthermore, there is a need to investigate the economic consequences and practicality of using Biophilic design principles in rehabilitation centers, as well as the viewpoints of stakeholders such as patients, caregivers, healthcare practitioners, and facility management.

The challenges of adopting Biophilic design concepts in Nigeria are significant, but so are the opportunities. With targeted interventions, collaborative efforts, and a commitment to continuous improvement, the Nigerian construction industry can achieve substantial progress that will not only benefit the industry itself but also contribute to the broader economic and social development of the country, ensuring that the built environment meets the highest standards of quality, sustainability, and efficiency (Ichendu & Amadi, 2024).

This research attempts to solve these gaps by examining the impact of Biophilic Architecture as a sustainable healing method in rehabilitation institutions. Specifically, the project will explore the impact of Biophilic design components on patient outcomes, staff well-being, and the overall healing environment. It will also examine the economic costs and benefits of using Biophilic design solutions in rehabilitation institutions and explore stakeholder perceptions and preferences about Biophilic Architecture. By advancing our understanding of the benefits and challenges associated with Biophilic Architecture in rehabilitation centers, this research aims to inform evidence-based design practices and promote the creation of healing environments that support the rehabilitation process and improve the well-being of patients, staff, and visitors.

2. The Study Area

The Niger Delta region of Nigeria is a physically and economically significant territory located in the southern region of Nigeria. It covers about 70,000 square kilometers and is noted for its immense wetlands, biodiversity, and vast oil and gas deposits. It comprises numerous Nigerian states, including Delta, Bayelsa, Rivers, Akwa Ibom, Cross River, Edo, and parts of Ondo, Imo, and Abia (Obi, 2010). The region's ecology is distinguished by abundant biodiversity but is also particularly sensitive to environmental degradation. It is the core of Nigeria's oil sector, contributing around 75% of government revenue and over 90% of the country's export revenues (Oluwaniyi, 2011).

Despite its economic significance, the revenue gained from oil has not translated into widespread development for the local community, leading to considerable socio-economic issues.

The Region is faced with several economic, social and political challenges: Poverty and Underdevelopment, Environmental Degradation and Health Issues (Nriagu et al., 2016; UNDP, 2006; Ebeku, 2001). The region has suffered substantial instability and violence as a result of conflict and militancy, frequently linked to the perceived injustices in the distribution of oil income. Militancy in the Niger Delta evolved as a response to these issues (Ikelegbe, 2005).

The Niger Delta is also ethnically diverse, with groups such as the Ijaw, Ogoni, Itsekiri, Urhobo, and others, ethnic tensions and competition over resources have sometimes led to wars within the region (Oluwaniyi, 2011).

Efforts to address the challenges in the Niger Delta have included government initiatives like the establishment of the Niger Delta Development Commission (NDDC) and the Ministry of Niger Delta Affairs, aimed at promoting development and addressing environmental and socio-economic issues (Obi, 2010). Additionally, several international organizations and NGOs are involved in the region, working on programs relating to sustainable development, environmental conservation, and conflict resolution (Amnesty International, 2009).

Access to mental health care is severely limited in the Niger Delta. There are few mental health experts and facilities, and those that do exist are generally under-resourced and unable to satisfy the need (Sambo, 2014).

3. What Is a Rehabilitation Centre?

A Rehabilitation center is an institution that provides specialized care and support to persons recuperating from physical injuries, diseases, substance misuse disorders, or mental health conditions. It offers comprehensive treatment programs focused at fostering recovery, restoring function, and enhancing the quality of life for those with disabilities or health difficulties (National Institute on Drug Abuse, 2020). It may specialize in several areas, such as physical rehabilitation, addiction treatment, psychiatric rehabilitation, or vocational rehabilitation (American Psychological Association, 2020).

Rehabilitation facilities play a critical role in the continuum of mental health care by offering rigorous, organized, and supportive environments for individuals with mental illness or drug use problems (substance Abuse and Mental Health Services Administration, 2021). These institutions help individuals build coping skills, increase social functioning, and restore independence in everyday living, supporting successful community reintegration and long-term recovery (American Psychological Association, 2020).

4. Concepts and Principles of Biophilic Architecture

Biophilic Architecture is founded on the notion that humans have an innate connection to nature and flourish in environments that combine natural components and patterns (Kellert et al., 2008). Stephen R. Kellert, a pioneer in Biophilic design, recognized numerous fundamental aspects of Biophilic Architecture, including natural light, vistas of nature, presence of water, and use of natural materials. Strategies such as improving access to natural light, including indoor plants and greenery, and creating therapeutic outdoor places can contribute to stress reduction, increased mood, and speedier healing among patients. These characteristics can be integrated into rehabilitation facility design to create places that assist patients' physical, emotional, and psychological well-being.

5. Niger Delta and Mental Health

The mental health of Residents in the Niger Delta region is a crucial problem due to several socio-economic and environmental factors:

(1) Environmental Degradation and stress: The Niger Delta has undergone substantial environmental degradation owing to oil spills, gas flaring, and deforestation, leading to tension and anxiety among people (Osuagwu et al., 2019). Studies have also connected exposure to environmental pollution in the Niger Delta to elevated rates of psychological distress and symptoms of post-traumatic stress disorder (PTSD) among impacted communities (Akpotu & Okonta, 2017).

(2) Economic Instability and Mental Health: Economic instability stemming from the reduction in agricultural and fishing operations, as well as the volatility of the oil industry, has contributed to financial stress and mental health difficulties in the Niger Delta (Agho et al., 2018). High levels of unemployment, poverty, and inequality exacerbate mental health disparities and raise the risk of depression and substance addiction in the region (Omokaro et al., 2016).

(3) Social Disruption and Trauma: Social disruption induced by communal conflicts, militancy, and forced displacement has devastating impacts on individuals and communities in the Niger Delta, resulting to heightened levels of psychological distress and trauma-related symptoms (Akpotu & Okonta, 2017). Children and adolescents in the Niger Delta are particularly sensitive to the negative impacts of violence and displacement, experiencing heightened rates of anxiety, sadness, and behavioral disorders (Ebigbo et al., 2020).

(4) Limited Access to Mental Health Services: Despite the considerable mental health needs in the Niger Delta, access to mental health services is typically limited due to a dearth of qualified experts, inadequate healthcare infrastructure, and stigma surrounding mental illness (Aghukwa, 2018). Many residents of the Niger Delta rely on traditional healers and informal support networks for mental health care, stressing the need for culturally sensitive and community-based methods to service delivery (Aghukwa, 2018).

Addressing the mental health difficulties experienced by inhabitants in the Niger Delta requires all-inclusive approach that addresses the basic socio-economic and environmental factors of mental disease. Interventions aiming at environmental remediation, economic empowerment, social assistance and mental health education is crucial for improving resilience and well-being in the region.

6. Findings

Several Architectural designs have used Biophilic design concepts and proved therapeutic effects on occupants. These Architectural projects offer as convincing illustrations of how Biophilic design concepts can favorably benefit occupants' health, well-being, and productivity.

(1) Khoo Teck Puat Hospital in Singapore:

The hospital integrates Biophilic elements such as natural light, plants, and views of nature throughout its Architecture to create a healing environment for patients. Research has revealed that patients in rooms with

views of the hospital's therapeutic gardens enjoyed reduced stress levels and improved recovery results (Verderber, 2012).

Figure 1. Sit out area of the Khoo Tech Puat Hospital with several Biophilic elements

Source: https://living-future.org/case-studies/award-winner-khoo-teck-puat-hospital/

(2) CHUM Research Centre, Montreal in Canada:

This research center incorporates extensive use of natural materials, indoor gardens, and atriums filled with plants to encourage well-being and productivity among tenants. Studies conducted at the plant have demonstrated that employees enjoy enhanced mood, job satisfaction, and cognitive performance in Biophilic surroundings (Grant & Heerwagen, 2014).

(3) Bullitt Center, Seattle in United State of America:

As a paradigm for sustainable design, the Bullitt Center features Biophilic characteristics such as natural ventilation, daylighting, and access to outdoor spaces. Occupants of the building have reported enhanced productivity, satisfaction, and well-being, attributing these impacts to the building's Biophilic characteristics (Heschong Mahone Group, 2013).

Figure 2. Bullitt center showing extensive use of daylight and biomimicry

Source: https://prismpub.com/biomimicry-in-architectural-design-the-bullitt-center/

(4) Edge Headquarters, Amsterdam in Netherlands:

This office building promotes Biophilic design concepts, including plentiful natural light, green roofs, and internal gardens, to provide a healthy and inspirational work environment. Studies conducted at the Edge Headquarters have showed considerable improvements in employee well-being, contentment, and productivity compared to conventional office buildings (Allen, 2017).

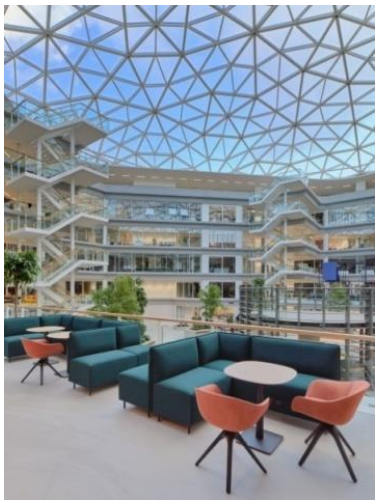

Figure 3. The Edge Headquarters Atrium with massive skylight

Source: https://edge.tech/developments/edge-amsterdam-west

(5) Terrapin Covey Park, Ohio in United States:

Terrapin Covey Park is a senior living community in Ohio, United States, created using Biophilic principles to increase the well-being of its members. The building contains aspects such as adequate natural light, views of greenery, and access to outdoor spaces with gardens and walking routes. Research conducted by Terrapin Bright Green, the Architecture firm behind the project, indicated that residents of Covey Park reported better levels of satisfaction, lower stress, and improved overall health compared to those living in standard senior housing facilities. The Biophilic design of Covey Park was recognized for generating a sense of connection to environment and promoting social contact among inhabitants, ultimately contributing to their well-being.

Figure 4. Terrapin Covey Park natural environment

Source: https://www.lowincomehousing.us/det/terrapin-park

(6) Sick Kids Hospital, Toronto in Canada:

The Sick Kids Hospital in Toronto, Canada, undertook a refurbishment project that utilized Biophilic design ideas to provide a healing environment for pediatric patients. The refurbishment featured the installation of a rooftop garden, internal green areas, and artwork inspired by nature throughout the facility. A study published in the Journal of Environmental Psychology indicated that pediatric patients admitted to Sick Kids Hospital experienced reduced anxiety levels and improved recovery outcomes compared to children in other hospitals without similar Biophilic design features.

The integration of natural elements into the hospital environment was demonstrated to have a calming effect on patients and their families, contributing to a more favorable healthcare experience.

Figure 5. The Sick Kids Hospital Atrium

Source: https://www.pinterest.ca/pin/i-r-n-8-0-0--528117493803082189/

7. Benefits

The inclusion of Biophilic design ideas in rehabilitation clinics can generate multiple benefits for patients, staff, and visitors. Research has demonstrated that exposure to nature and natural components within the built environment can reduce stress, anxiety, and pain levels, leading to faster recovery periods and greater health outcomes. Additionally, Biophilic design can enhance mood, increase productivity, and foster a sense of peace and well-being among residents, clients and patients.

8. Socio-Economic Importance

The implementation of Biophilic design concepts in Rehabilitation institutions in the Niger Delta region of Nigeria bears major socio-economic importance:

(1) Health and Well-being Benefits:

Biophilic design in rehabilitation institutions can contribute to improved patient outcomes by promoting speedier healing, reducing stress levels, and boosting general well-being (Orubu & Olu-Owolabi, 2017). By developing therapeutic spaces that connect patients with nature, Biophilic design can help minimize the strain on the healthcare system by minimizing the length of hospital stays and the need for further medical interventions (Ite & Iniaghe, 2017).

(2) Increased Productivity and Job Satisfaction:

Employees working in Biophilic workplaces likely to have higher levels of job satisfaction, productivity, and overall well-being (Grant & Heerwagen, 2014). Rehabilitation clinics constructed with Biophilic principles can attract and retain experienced healthcare personnel, leading to better staff morale and performance.

(3) Tourism and Economic Development:

Biophilic rehabilitation clinics can serve as models of sustainable healthcare infrastructure and eco-tourism attractions, drawing visitors and generating cash for local communities (Olotuah et al., 2015). By supporting eco-friendly practices and exhibiting the region's natural beauty, Biophilic design can contribute greatly to the sustainable development of the Niger Delta region's tourism industry.

(4) Community Engagement and Cultural Preservation:

Incorporating traditional Architectural materials and cultural motifs in Biophilic design celebrates the rich cultural legacy of the Niger Delta region, generating a sense of pride and identity among local populations (Orubu & Olu-Owolabi, 2017). Community involvement in the planning and construction process of rehabilitation facilities increases social cohesiveness and encourages locals to take ownership of their healthcare infrastructure.

(5) Environmental Sustainability:

Biophilic design encourages sustainable construction techniques, such as energy efficiency, water conservation, and use of renewable materials, helping to environmental conservation efforts in the Niger Delta region (Ite & Iniaghe, 2017). By lowering the ecological footprint of rehabilitation centers, Biophilic design coincides with global sustainability goals and mitigates the impact of climate change on local communities. Furthermore, addressing the regulatory bottlenecks and ensuring a smoother approval process can significantly enhance the implementation of effective preconstruction practices. Economic policies that stabilize and provide financial support for sustainable practices will encourage developers to adopt more advanced technologies and sustainable method (Ichendu & Amadi, 2024).

9. Implementation Strategies

Implementing Biophilic Architecture in rehabilitation institutions in the Niger Delta region involves careful planning and coordination among architects, healthcare experts, and local populations, including consideration of local climate circumstances, cultural preferences, and budget limits. Strategies for implementation may include:

• Incorporating sourced natural traditional building materials and techniques that represent the cultural legacy of the region.

• Designing outdoor healing gardens and therapeutic landscapes that showcase the region's biodiversity.

• Engaging local artists and craftsmen to create Biophilic items, such as handcrafted furniture and artworks inspired by nature.

• Maximizing natural day lighting in the building designs.

• Incorporating indoor plants and greenery.

• Engaging with healthcare professionals, architects, and community stakeholders.

• Develop pilot projects or prototypes to test Biophilic design components and gather feedback from patients and staff and use these insights to modify and optimize the design for larger-scale implementation.

• Provide training for architects, builders, and healthcare providers on biophilic design ideas and techniques.

• Educate patients and staff about the benefits of Biophilic surroundings and how to engage with the natural aspects of the center.

All these are crucial to ensure that Biophilic design promotes the performance of rehabilitation centers while addressing the needs of patients and staff.

10. Empirical Evidence of Healing Effect of Biophilic Design Strategies

In rehabilitation centers in Nigeria, several peculiar mental health conditions are treated, including substance use disorders (SUDs), Post-Traumatic Stress Disorder (PTSD), depression and anxiety disorders, psychosis and schizophrenia, and traumatic brain injury (TBI) (Adelekan et al., 2010; Olley et al., 2014; Gureje et al., 2006; Odejide, 2006; Oyesanya et al., 2015).

Biophilic design methods can be integrated into rehabilitation center surroundings to complement treatment procedures and support individuals with these mental health issues, some empirical evidence supports the healing effects of Biophilic design strategies across many contexts:

(1) Substance Use Disorders (SUDs):

Green Spaces, Gardens and Natural Materials: Incorporating green spaces and healing gardens into rehabilitation clinics can give opportunities for relaxation, stress reduction, and physical activity, which are useful for persons recovering from substance abuse (Detweiler et al., 2012) and using natural materials such as wood and stone in interior design can provide a tranquil and pleasant environment, boosting emotions of stability and comfort for those undergoing detoxification and rehabilitation (Bringslimark et al., 2007).

(2) Post-Traumatic Stress Disorder (PTSD):

Nature Views and Water Features: Offering views of natural landscapes or outdoor areas from treatment rooms and common areas can create a sense of safety and peace for patients with PTSD, reducing feelings of hyper alertness and anxiety (Kaplan, 1995) and integrating water components such as fountains or indoor waterfalls can elicit a sense of tranquility and relaxation, helping persons with PTSD manage symptoms of arousal and distress (White et al., 2010).

(3) Depression and Anxiety Disorders:

Daylighting and Indoor Plants: Maximizing access to natural light through skylights, windows, and light wells can boost mood and energy levels for those with depression and anxiety, promoting feelings of vitality and well-being (Beute & de Kort, 2018) and introducing indoor plants and living greenery into rehabilitation center

facilities can boost air quality, reduce stress, and elevate mood, offering psychological advantages for persons with depressive and anxious symptoms (Bringslimark et al., 2007).

(4) Psychosis and Schizophrenia:

Biophilic Patterns and Outdoor Spaces for Social Interaction: Incorporating Biophilic patterns and textures inspired by nature, such as fractal geometries or organic motifs, can stimulate cognitive engagement and visual interest for individuals with psychosis and schizophrenia, supporting therapeutic engagement and sensory integration (Joye, 2007) and designing outdoor meeting areas and communal gardens might give chances for sociability and peer support among those with schizophrenia, fostering a sense of belonging and connection to nature (Sugiyama & Ward Thompson, 2007).

(5) Traumatic Brain Injury (TBI):

Therapeutic Landscapes and Restorative surroundings: Creating therapeutic outdoor landscapes with sensory-rich elements, such as textured pathways, aromatic plants, and interactive sculptures, can support cognitive rehabilitation and sensory integration for individuals with TBI, promoting recovery and neuroplasticity (Marcus & Barnes, 1999).

(6) Stress Reduction and Well-being:

Ulrich's fundamental study proved that hospital patients with views of nature from their windows suffered less stress and recovered more quickly compared to those with views of a brick wall (Ulrich, 1984). Beute and de Kort also conducted a study showing that exposure to natural factors, such as greenery and daylight, led to reduced stress levels and higher well-being among individuals with varied levels of depression (Beute & de Kort, 2018).

(7) Improved Cognitive Function:

A study by Berman and colleagues indicated that walking in a natural setting increased cognitive function, enabled mental healing, boosted cognitive functioning, validating the Attention healing Theory and attention performance compared to walking in urban contexts (Berman et al., 2008).

(8) Faster Recovery and Pain Reduction:

Patients in hospital rooms with views of nature had shorter postoperative hospital stays, took fewer pain medications, and reported fewer problems compared to those with views of a brick wall (Ulrich, 1984). Another study by Tennessen and Cimprich likewise revealed that patients recovering from surgery in rooms with views of nature had better outcomes, including lower pain ratings and shorter hospital stays, compared to those with urban views (Tennessen & Cimprich, 1995).

(9) Mood Enhancement and Stress Reduction:

Research by Bringslimark and colleagues indicated that indoor plants lowered physiological and psychological stress reactions, leading to better mood and well-being among office workers (Bringslimark et al., 2007). Another study by Joye and van den Berg revealed that exposure to Biophilic features, such as natural materials and views of nature, positively improved mood and reduced stress levels in office environments (Joye & van den Berg, 2011).

(10) Increased Productivity and Job Satisfaction:

Research by Shibata and Suzuki found that personnel in offices with indoor plants reported higher levels of job satisfaction, perceived air quality, and concentration compared to those in surroundings without plants (Shibata & Suzuki, 2004). Research by Lohr and Pearson found that adding natural elements into workplace surroundings led to enhanced productivity and job satisfaction among employees (Lohr & Pearson-Mims, 2000).

These empirical studies provide robust evidence of the healing effects of Biophilic design strategies on various aspects of human health and well-being and integrating these Biophilic design strategies into the built environment of rehabilitation centers in the Niger Delta can enhance the therapeutic experience and contribute to improved mental health outcomes for individuals undergoing treatment.

11. Conclusion

Biophilic Architecture offers a sustainable and culturally appropriate method to enhance the healing environment of rehabilitation institutions in the Niger Delta region. By reconnecting patients with nature within the built environment through integrating natural materials and cultural motifs into the built environment, these facilities can give patients with therapeutic environments that enhance physical, mental, and emotional well-being. Through interdisciplinary collaboration and community participation, among healthcare providers, architects, policymakers, and communities to build environments that support holistic healing and rehabilitation. Biophilic design can assist to the sustainable development and resilience of healthcare facilities in the Niger Delta.

12. Recommendations

(1) Incorporate Indigenous Flora and Fauna: Use local plant species for landscaping to create healing gardens and green spaces around the rehabilitation center and integrate bird feeders, butterfly gardens, and aquatic features to attract local wildlife, enhancing the connection to the regional ecosystem.

(2) Maximize Natural Light and Ventilation: Designing buildings with big windows, skylights, and open courtyards to provide enough natural light and ventilation and use movable windows and passive cooling measures to reduce reliance on artificial climate control, increasing air quality and comfort.

(3) Use of Natural Materials: Employ locally produced, sustainable materials such as bamboo, lumber, and adobe for construction and incorporate natural textures and colors in interior design to create a relaxing environment.

(4) Water Features: Integrate water elements like fountains, ponds, or streams within the center's environment and use rainwater harvesting systems to sustainably manage water resources and produce relaxing noises capes.

(5) Therapeutic Gardens & Green locations: Design therapeutic gardens that patients may interact with, including sensory gardens with aromatic plants and tactile surfaces and provide locations for horticultural treatment where patients can engage in gardening activities.

(6) Views of Nature: Ensure that patient rooms, common areas, and therapy rooms have views of natural landscapes, such as gardens, forests, or water bodies and use Biophilic design features, such as green walls or murals representing natural settings, in locations where views are limited.

(7) Cultural and Ecological Context: Incorporate local cultural features and traditional architectural styles to create a feeling of place and identity and engage with local communities and stakeholders in the design process to ensure the facility represents the region's cultural and ecological legacy.

(8) Sustainable methods: Implement renewable energy technologies, such as solar panels, to lower the environmental imprint of the facility and use eco-friendly building methods and materials to guarantee the center's activities are sustainable and environmentally responsible.

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