Optimizing Occupant Satisfaction in the Proposed Design of NDLEA Rehabilitation Center in Khana, Rivers State

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Abstract
This research proposes a design framework for a proposed National Drug Law Enforcement Agency (NDLEA) rehabilitation center that prioritizes occupant satisfaction through the integration of the United Nations Sustainable Development Goals (SDGs). This study explores the critical role of architectural design in enhancing the psychological and physical well-being of recovering substance users. Traditional rehabilitation facilities often prioritize security over the psychological and physical well-being of occupants, leading to environments that can hinder recovery. This study addresses this gap by optimizing environmental, spatial, and psychological comfort, grounded in SDG 3 (Good Health and Well-being). By implementing passive design strategies, such as optimized natural ventilation and biophilic elements, the proposed design creates a therapeutic atmosphere conducive to detoxification and mental healing. Furthermore, the research incorporates SDG 10 (Reduced Inequalities) and SDG 16 (Peace, Justice, and Strong Institutions) by ensuring the facility's spatial configuration promotes dignity and inclusivity for all demographics, regardless of socio-economic background. The design emphasizes non-institutional aesthetics to reduce the stigma associated with drug rehabilitation, fostering a sense of social justice and safety. Aligning with SDG 11 (Sustainable Cities and Communities), the project utilizes locally sourced materials and climate-responsive facade layering to ensure the facility is resilient and integrated into the urban fabric of the Niger Delta region. The methodology employs a mixed-methods approach, combining literature reviews of modern rehabilitation models with technical climate simulations. The results demonstrate that an SDG-led design approach significantly enhances occupant thermal and psychological comfort, ultimately increasing the efficacy of the rehabilitation process and providing a scalable model for public institutional architecture in Nigeria.

Key-words: *- Occupant satisfaction, NDLEA Center, Sustainable Development Goals, Rehabilitation Architecture Therapeutic Architecture, Biophilic Design.*

1. Introduction

The architectural evolution of rehabilitation facilities has shifted from punitive, institutional environments toward therapeutic spaces that prioritize the human experience. In Nigeria, the challenge of substance abuse requires a multi-dimensional approach that integrates security with recovery. This study focuses on the proposed design of a National Drug Law Enforcement Agency (NDLEA) rehabilitation center, utilizing the United Nations Sustainable Development

Goals (SDGs) (United Nations, 2015). as a foundational framework. By aligning the design with SDG 3 (Good Health and Well-being) and SDG 11 (Sustainable Cities and Communities), the project seeks to create a resilient, climate-responsive environment that fosters healing. Furthermore, the integration of SDG 10 (Reduced Inequalities) and SDG 16 (Peace, Justice, and Strong Institutions) ensures that the facility promotes social justice and provides equitable access to quality care, regardless of the occupant's socio-economic status.

1.1 Problem of The Statement: Most existing public institutional buildings in Nigeria, particularly those under law enforcement jurisdictions, are characterized by "hard architecture"—environments that prioritize surveillance and confinement over occupant satisfaction. These facilities often suffer from poor thermal regulation, inadequate natural lighting, Ventilation, and a lack of connection to nature, all of which are critical for psychological recovery.

1.2 Aim: To develop a design framework for an NDLEA rehabilitation center that optimizes occupant satisfaction and therapeutic outcomes through the integration of Sustainable Development Goals 3, 10, 11, and 16.

1.3 Objectives

1. To evaluate existing rehabilitation center models in Nigeria to identify gaps in occupant comfort and sustainability.
2. To identify specific architectural strategies that align with the targets of SDG 3 (health) and SDG 11 (sustainable communities).
3. To design a facility layout that promotes dignity and social equity in line with SDG 10 and SDG 16.
4. To simulate the performance of proposed material layering and passive design techniques to ensure optimal thermal comfort for occupants.

1.4 Scope: The study focuses on a proposed site within the Niger Delta region, specifically accounting for the humid tropical climate of Rivers State. The research covers spatial configuration, facade development using material layering, and passive environmental control strategies (Ventilation and lighting) and is bounded by the technical and social indicators of SDGs 3, 10, 11, 16 as they apply to institutional architecture.

1.5 Significance of the Study: This study holds significant value for both the architectural profession and public health policy in Nigeria. For Architecture, it provides a template for "African Modernism" that balances technical performance with social responsibility, moving away from purely aesthetic concerns. For the NDLEA, the proposed design offers a functional model that enhances the success rate of rehabilitation programs by providing a humane and restorative environment. For Society, by incorporating SDG 16, the project contributes to the strengthening of public institutions, demonstrating that justice and peace can be facilitated through inclusive and well-designed infrastructure.

2. Literature Review

The rise in substance use disorders (SUD) globally has necessitated a shift from purely punitive approaches to health-centered rehabilitation strategies. In Nigeria, drug abuse has transitioned from a transit issue to a severe public health crisis, with Port Harcourt (Rivers State) serving as a

high-prevalence hub due to its urbanized, industrial, and coastal nature. The National Drug Law Enforcement Agency (NDLEA) has acknowledged the need to move beyond arrests toward demand reduction through treatment, proposing new, standardized rehabilitation facilities across the country. But the rehabilitation of addicts is hampered by a lack of infrastructure, limited funding, and a punitive rather than therapeutic approach.

Introduction to Therapeutic Architecture and the SDGs

Research shows that therapeutic environments significantly influence patient outcomes by reducing stress, anxiety, and relapse risk (Ulrich et al., 2008). Architectural design affects mood, behavior, social interaction, and overall treatment efficiency (Hamilton, 2010). Good rehabilitation architecture balances safety, structure, autonomy, and comfort, environmental psychology is therefore applied through the examination of spatial perception, behavioral patterns, and cognitive processes within therapeutic environments.

One of the key principles of therapeutic architecture is the use of natural light and views of nature. Research has shown that exposure to natural light and nature can have a positive impact on mood, sleep, and overall well-being of patients (Ulrich, 1984). Ulrich further states that patients in hospital rooms with windows overlooking nature had shorter hospital stays, required fewer pain medications, and reported higher levels of satisfaction than patients in rooms without views of nature. This literature review examines the current state of drug addiction in Nigeria, the effectiveness of existing rehabilitation methods, the challenges faced by NDLEA in treatment, how SDG 3 (Health), SDG 10 (Equity), SDG 11 (Sustainable Cities), and SDG 16 (Justice) form a holistic basis for rehabilitation design, and the need for specialized, evidence-based rehabilitation infrastructure.

2.1 Conceptual Framework: SDG-Driven Rehabilitation Design

This framework operates as a logic model where Global Mandates (Inputs) drive Architectural Actions (Interventions) to produce Human-Centric Results (Outcomes).

Table 1: illustrating the relationship between the SDG inputs, the Design Interventions, and the Expected Outcomes.

Input (SDG Framework)	**Architectural Intervention**	**Expected Outcome (Occupant satisfaction)**
SDG 3: Health	Passive ventilation and natural lighting	**Physical comfort:** improved air quality, and circadian rhythm regulation
SDG 10: Reduced Inequalities	Inclusive, non-institutional layouts	**Social comfort:** feeling of dignity, safety and equality
SDG 11: Sustainable Cities	Local material layering and resilient facade	**Thermal comfort**: reduction in heat gain, environmental sustainability.
SDG 16: Strong Institutions	Transparency and Security-with -Dignity	**Psychological comfort**: reduced anxiety, trust in the recovery process

2.3 Theoretical Framework

The study is anchored on two primary theories:

1. Salutogenic Design Theory (Aaron Antonovsky): Unlike "pathogenesis," which focuses on disease, Salutogenesis focuses on factors that support human health and well-being. The design incorporates "Sense of Coherence" (SOC) by making the environment comprehensible (clear wayfinding), manageable (access to resources), and meaningful (artistic and cultural markers).

2. Biophilia Hypothesis (Edward O. Wilson): This theory suggests humans possess an innate tendency to seek connections with nature (Kellert et al., 2008). and other forms of life. Its strategic visual access to landscapes, natural materials, water features, and sensory plantings have been associated with improved mood, cognitive restoration, and stress reduction. Hence integrating nature improves mental health and reduces withdrawal anxiety (Kellert, 2015). These approaches support therapeutic activities (horticultural therapy, farm-based therapy) and resilience (rainwater harvesting, passive cooling), aligning environmental stewardship with patient recovery. The center will utilize indoor greenery, water features, and expansive views of nature to lower blood pressure and improve heart rate variability among recovering occupants.

Empirical Framework:

An empirical framework focuses on the interaction between institutional interventions, patient psychology, and socio-environmental factors. This framework is typically grounded in the Biopsychosocial-Spiritual (BPSS) Model or Routine Activity Theory, aiming to measure how specific variables influence the ultimate goal: successful reintegration and the prevention of relapse.

The Empirical Framework Structure

The framework can be categorized into four primary variable groups: Independent (Inputs), Mediating (Processes), Moderating (Context), and Dependent (Outcomes).

VARIABLE CATEGORY	VARIABLE	DESCRIPTION/MEASUREMENT
Independent (Institutional	Counselling Techniques	Effectiveness of solution-focused therapy (SFT), CBT, or motivational interviewing
	Facility Quality	Availability of medical staff, bed space, and vocational training tools
	Program Duration	Length of stay, (short term vs. long term) and follow-up frequency
Mediating (Psychological)	Self-Efficacy	The patient belief in their ability to resist drugs (measured via dases)
	Substance Expectancy	Positive vs negative beliefs about the effects of drugs
	Resilience	Ability to cope with stressors without reverting to substance use
	Peer Pressure	Influence of the drug-using environment post-discharge

Moderating (Socio-Environmental)	Stigma	Level of social rejection or family acceptance
	Demographics	Age, employment status, and educational attainment.
Dependent (Outcome)	Relapse Rate	The frequency and severity of returns to dug use after treatment
	Reintegration	Successful return to employment or education

2.4. Summary

Past academic and policy reviews of the National Drug Law Enforcement Agency (NDLEA) rehabilitation centers in Nigeria reveal that while the agency has successfully counseled and treated tens of thousands of drug-dependent individuals, its institutional capacity and aftercare frameworks remain heavily constrained. Most studies focus solely on counseling techniques rather than the physical environment in which those techniques are applied, There is a need for research that bridges the gap between rehabilitation policy and spatial/architectural implementation.

Limitations

Literature frequently highlights that the NDLEA's rehabilitation centers face gross inadequacies in staffing, funding, and bed space. A major limitation identified in regional centers is the lack of specialized infrastructure and designated provisions for female drug users. Past works point out that a lack of robust aftercare programs leads to a high rate of relapse, as released individuals are often reintegrated back into society without sustained socioeconomic support.

Knowledge Gap

Previous studies have heavily focused on short-term psychological counseling techniques and initial detoxification outcomes. A distinct gap exists in understanding the long-term socioeconomic reintegration of rehabilitated addicts. Furthermore, there is a lack of localized, gender-disaggregated, and empirical data on how NDLEA centers adapt to the rising prevalence of youth and female addiction across different geopolitical zones.

Current Work

In response to the growing national drug crisis, current efforts by the NDLEA and the United Nations Office on Drugs and Crime (UNODC) focus on decentralizing and expanding treatment. Current initiatives feature: Expanding the agency's operational capacity to dozens of rehabilitation centers nationwide to address the unmet demand for treatment, leveraging partnerships with the Federal Ministry of Health and Federal Ministry of Youth Development to improve both mental health services and post-rehab vocational support. This research aims to address this gap by proposing a rehabilitation center that integrates evidence-based therapeutic counseling with modern architectural designs aimed at promoting abstinence and reducing relapse.

3. Methodology

This research adopts a mixed-methods research design (Creswell, J. W. 2014), combining qualitative architectural analysis with quantitative environmental simulations to evaluate and optimize occupant satisfaction. The methodology is structured into four distinct phases, ensuring the design is grounded in both theoretical global standards (SDGs) and site-specific climatic realities.

1. **Literature Review** across healthcare design, biophilia, regenerative design, adaptive architecture, and addiction treatment outcomes

2. Case Study Analysis and Pre-Design Research

The first phase involves a comparative analysis of existing rehabilitation facilities and institutional buildings in Nigeria like the **Rumuigbo Neuropsychiatric Hospital, Port Harcourt,**

- Qualitative Assessment: Conducting a technical review of the "hard architecture" prevalent in current NDLEA facilities to identify psychological triggers and physical discomforts.
- Best Practice Review: Analyzing international models of therapeutic architecture that successfully integrate SDG 3 and SDG 16, such as the **Kronstad Psychiatric Centre, Bergen, Norway** or modern psychiatric clinics in sub-Saharan Africa.

3 Site Analysis and Climatic Mapping: To address SDG 11 (Sustainable Cities and Communities), a detailed analysis of the Khana site's topography, prevailing winds (South-West monsoons), and vegetation is conducted

4: Design Development and SDG Integration: The design phase translates the research findings into architectural solutions.

4. Case Studies

Table 4.1 comparative analysis of case studies

DESIGN FEATURE	**NEUROPSYCHIATRIC HOSPITAL, RUMUIGBO** 	**FEDERAL NEUROPSYCHIATRIC HOSPITAL, ARO** 	**KRONSTAD REHAB CENTER, BERGEN** 	**THE HILLS REHAB CENTER, THAILA** 	**NDLEA REHAB CENTER, ABA ROAD** 

Architectural Typology	**Pavilion/Campus Style**. Disconnected blocks within a fenced perimeter	**Village/Community Model.** Developed the "Aro Village" system to integrate patients with the environment.	**Urban Integration**. A compact, high-design facility integrated into the city fabric.	**Resort/Hospit -ality**. High-end tropical vernacular focused on luxury and seclusion.	**Institutional/ Secure**. Often repurposed or standard administrative-style architecture.
Circulation & Layout	Linear, outdoor walkways between wards; high reliance on natural ventilation.	Open-plan "village" layout to reduce the feeling of incarceration.	Vertical stacking with internal "streets" and atrium-focused navigation.	Decentralized villas connected by lush, landscaped paths.	Centralized, corridor-based layouts with heavy emphasis on security checkpoints.
Biophilic Integration	**Accidental biophilia** (mature trees/green space), but lacks intentional restorative gardens.	Strong connection to the landscape; use of "therapeutic landscapes" within the village.	**Intentional /Scientific**. Use of timber, large windows for fjord views, and internal winter gardens.	Maximized. Seamless indoor-outdoor flow, water features, and mountain vistas.	**Minimal;** typically restricted to basic courtyard spaces or perimeter greenery.
Materiality & Aesthetics	Concrete, render, and iron grilles; functional but often feels clinical or "hard."	Traditional masonry and mid-century institutional finishes; emphasis on durability.	Warm Materiality. Significant use of light wood, glass, and acoustic-damping textiles.	Natural stone, wood, and thatched elements to mimic a retreat environment.	Standard institutional materials (concrete, tile, security bars).

Light & Ventilation	High reliance on passive cross-ventilation; small-to-medium apertures.	Natural lighting prioritized in residential units to maintain circadian rhythms.	Circadian Lighting. Large glass facades to combat seasonal affective disorder (SAD).	Wide-open vistas; 100% natural light saturation in public zones.	Functional lighting; often limited by high-security window specifications.
Patient Autonomy	**Limited;** movement is restricted between gated wards.	**High**; patients are encouraged to interact within the "village" social structure.	**Balanced;** "healing architecture" principles allow for controlled freedom of movement.	**High;** designed to feel like a guest experience rather than a clinical stay	**Low-to-Moderate**; primary focus on supervision and monitored recovery.

5. The Proposed Design Concept: "The Healing Village''

The proposed center is designed as a series of small, interconnected clusters representing a homestead arrangement which reduces anxiety in patients by creating a familiar non-residential institutional environment. Each residential cluster centers around a landscaped courtyard that has aromatic plants and fruit trees, facilitating social interaction, outdoor therapy, and natural surveillance by staff. the "Village" concept is naturally sustainable because it emphasizes decentralization, nature, and community-which aligns perfectly with the United Nations Sustainable Development Goals

5.1 Zoning and Spatial Organization

The facility is divided into three distinct zones to ensure safety and privacy:

The Public Zone: Administrative/Medical offices, NDLEA staff quarters, and a community outreach hall and outdoor recreation

The Semi-Private Zone: Vocational workshops (tailoring, ICT, etc) and counseling, isolation and detox rooms.

The Private (Therapeutic) Zone: Detoxification wards, residential hostels, and the **"Healing Garden."**

Circulation Zone: Separate public, staff, and emergency routes to ensure privacy and safety while allowing social access to non-sensitive therapeutic spaces.

5.2 Biophilic and Regenerative Interventions

The Healing Village concept for the proposed NDLEA rehabilitation center in Khana LGA shifts the architectural paradigm from a **"detention"** facility to a **"restorative ecosystem."** reconnecting residents with the natural rhythms of the Khana landscape.

- **Therapeutic Landscapes (Healing Gardens):** a **"village"** layout where interstitial spaces between buildings are filled with indigenous flora, sensory gardens with local plants like Ocimum gratissimum (Scent leaf) for aromatherapy and horticultural therapy.
- maximize north-south orientation to allow for soft, natural light without the heat gain of the

afternoon sun.

❖ Natural Ventilation (Stack Effect) through the use of high ceilings and "thermal chimneys," Perforated screens (breeze blocks) which allow for "see-through", security that feels open rather than caged, promoting a sense of freedom.

❖ Incorporate rainwater harvesting and decentralized wastewater treatment (like a constructed wetland)..

❖ Locally Sourced Materiality: Use compressed earth bricks (CEB) made from local soil and bamboo for shading elements.

❖ The use of changes in topography, water features, or dense "living fences" instead of barbed wire to foster a culture of trust and peace, aligning with Sustainable Development Goals.

6. Discussion: Impact on the Khana Community

The location in Khana is strategical as siting a Federal/State project in khana acts as a catalyst for local development. In terms of;

Employment generation; Aside NDLEA personnel, the center requires support staff-nurses, social workers, administrative officers, security, and maintenance crews, which can be sourced from the local khana community

Infrastructure Spin-Offs: The establishment of such a facility typically necessitates improvements in access roads, electricity supply, and water infrastructure in the host community.

Support for the local economy: the presence of staff and visiting families increases demand for local housing, food vendors, and transportation services, stimulating the informal economy.

Community watch: the presence of the NDLEA in the community will act as a deterrent to the open-sale of illicit substance by street vendors and patent medicine stores which are currently identified as the major supply points the region

7. Conclusion

The design for the NDLEA In Khana Local Government Area proves that architectural interventions are not merely aesthetic choices but are essential tools for therapeutic success. By optimizing occupant satisfaction through the integration of Sustainable Development Goals (SDGs), into the very fabric of the building, the facility moves beyond mere containment to become an active participant in the recovery process and becomes a sustainable beacon for social justice and health in the Niger Delta region.

8. Recommendations

The research recommends tropical climate adaptations through the use of passive Cooling and Natural Ventilation strategies to minimize dependence on mechanical systems - wide overhangs for shade, raised floors to prevent humidity related issues, and durable, low maintenance materials. It also recommends the Adoption of Universal Design (UD) principles throughout the facility while integrated recreational facilities to aid physical detox and psychological wellbeing, Utilizing Indigenous Building Materials and local labor from Khana LGA and Moving away from "Cellular" layouts toward Open-Plan Shared Governance spaces, flexibility and modularity, so the spaces can be adapted for individual or group counselling sessions, thereby accommodating changing treatment needs.

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