

# PROPOSED MULTI-SPECIALIST HOSPITAL IN PORT HARCOURT, NIGERIA: TOWARDS INTEGRATING BIOPHILIC DESIGN FOR WELLBEING.

 $\mathbf{BY}$ 

## ASINOBI ALMA AMARACHI 14CA017476

**NOVEMBER, 2020** 

# PROPOSED MULTI-SPECIALIST HOSPITAL IN PORT HARCOURT, NIGERIA: TOWARDS INTEGRATING BIOPHILIC DESIGN FOR WELLBEING.

 $\mathbf{BY}$ 

# ASINOBI ALMA AMARACHI MATRIC NO: 14CA017476

A DISSERTATION SUBMITTED TO THE SCHOOL OF POST GRADUATE STUDIES, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF MASTERS OF SCIENCE (M.Sc.) IN ARCHITECTURE OF THE DEPARTMENT OF ARCHITECTURE, COLLEGE OF SCIENCE AND TECHNOLOGY, COVENANT UNIVERSITY OTA, OGUN STATE, NIGERIA

SUPERVISOR: DR. ISIDORE C. EZEMA

#### **DECLARATION**

I, ASINOBI, Alma Amarachi (14CA017476), of the Department of Architecture, College of Science and Technology, Covenant University, Ota, Ogun state, hereby declare that the information contained in this dissertation work is the result of an honest academic research undertaken by me. I attest that the dissertation has not been presented wholly or partially Lfor the award of any degree elsewhere. All sources of data and scholarly dissertation information used in this dissertation are duly acknowledged.

A ' 1' A1 A 1'	
Asinobi Alma Amarachi	

Signature & Date

#### **CERTIFICATION**

I certify that this dissertation titled "Proposed Multi-Specialist Hospital In Port Harcourt, Nigeria: Towards Integrating Biophilic Design For Wellbeing" is an original research work carried out by ASINOBI, Alma Amarachi (14CA017476), in the Department of Architecture, College of Science and Technology, Covenant University, Ota, Ogun state, Nigeria, under the supervision of Dr Isidore C. Ezema.

Supervisor

Dr Isidore C. Ezema

Signature & Date

Head of Department

Dr. Adedapo Oluwatayo

Signature & Date

#### **ACCEPTANCE**

This is to attest that this thesis was carried out by AS	INOBI ALMA AMARACHI, has
met the required standard for the award of the degree	of Master of Science [M.Sc.] in
Architecture and has been accepted by the School of	Postgraduate Studies, Covenant
University, Ota, Ogun state.	
Mr. J. A. Philip	
Secretary, School of Postgraduate Studies	Signature & date
Prof. A. H. Adebayo	
Dean, School of Postgraduate Studies	Signature & date

#### **DEDICATION**

This design thesis is dedicated to the glory of God, the service of humanity, community of Architecture and the people of Port-Harcourt.

#### ACKNOWLEDGEMENT

This thesis would not have been possible without the undeniable help of God and the assistance of my ever-supportive parents, Pst. and Mrs. Asinobi. I want to specially thank my parents for their financial support and continuous encouragement throughout the two years of this exhausting Master's Program.

I want to thank my supervisor, Dr. I.C. Ezema, for his guidance and thorough, insightful contributions to this work. I also want to acknowledge the contributions made by Dr. Oluwatayo and Dr. Ekhaese and my external supervisor, Prof. Amole. Thank you for the inspiration, support, and for showing me what is possible.

Lastly, I want to acknowledge contributions made by my friends Omarosa Eghobamien, Joshua Omoijiade, Paul Yakubu, Joshua Ukwedeh, Foluso Akinrowo; throughout this work. It would not be complete without you.

#### **Table of Contents**

Declaration	i
Certification	ii
Acceptance	iii
Dedication	iv
Acknowledgement	v
Table of Content	vii
List of Figures	X
List of Tables	xi
List of Plates	xii
Appendices	xiii
Abstract	xiv
CHAPTER ONE	11
INTRODUCTION	11
1.1 Background to the Study	11
1.2. Statement of Research Problem	14
1.3 Aim of the Study	16
1.4 Objectives of the Study	16
1.5 Justification for the Study	17
1.6 Client/Users	17
1.7 Scope of the Study	18
1.8 Limitations of the Study	18
CHAPTER TWO	19
REVIEW OF LITERATURE	19
2.0 Introduction	19
2.1 Human Health and Wellbeing	21
2.2 Determinants of Human Health and Wellbeing	22
2.3 Biophilia	26
2.4 Relationship Between Nature and Human Health	27
2.5 Current Urbanity	28

	2.6 Biophilic Design	29
	2.7 Approaches to Biophilic Design	31
	2.8 Biophilic Design Attributes	35
	2.9 Points of the Biophilic Effect on Humans	36
	2.10 Benefits of Biophilic Design	40
	2.11 Overview of the Nigerian Healthcare System	41
	2.12 Problems of Hospital Designs in Nigeria	42
	2.13 Biophilic Design as a Solution	43
CH.	APTER THREE	44
R	ESEARCH METHODS	44
	3.0 Introduction	44
	3.1 Research Philosophy	44
	3.2 Methods of Data Collection	45
	3.3 Research Design	45
	3.4 Study Population	46
	3.5 Sampling Techniques	47
	3.6 Sample Size	47
	3.7 Unit of Data Collection	48
	3.8 Operationalization of Variables	48
	3.9 Design of Data Collection Instruments	51
	3.10 Data Collection and Analysis	51
CH.	APTER FOUR	55
D	ATA PRESENTATION AND ANALYSIS	55
	4.0 Introduction	55
	4.1 Objective 1: To Identify the Main Approaches to Biophilic Design	55
	4.2 Objective 2: To investigate how biophilic design principles have been used in design of healthcare facilities to improve human health and wellbeing	58
	4.4 Objective 3: To determine the users' perception of the impact of biophilic desi principles on their health and wellbeing.	
	4.5 Users' perception of the impact of biophilic design principles on their health at wellbeing	nd 86

4.6 Extent of Perceived Impact of Biophilic Patterns on Wellbeing	90
4.7 Users' Preferences of Biophilic Design Elements in the Environment	90
SITE AND ENVIROMENTAL ANALYSIS	93
4.9 Overview of Port Harcourt City	93
4.10 Criteria for Choosing Site	95
4.12 Features of The Site	97
CHAPTER FIVE	101
DESIGN CRITERIA	101
5.1 Project Goals and Objectives	101
5.2 Functional and Space Criteria.	101
5.2.1 Administrative Unit	103
5.2.2 Records and Documentation Unit	103
5.2.3 In-Patients Unit	104
5.2.4 Accidents and Emergency Unit	104
5.2.5 Theatres	104
5.2.6 Out-Patients Unit	105
5.2.7 Diagnostics Unit	105
5.2.8 Operation and Maintenance Support	105
5.2.9 Healing Garden	105
5.3 Performance Requirements of the Hospital	106
5.3.1 Accessibility	106
5.3.2 Lighting	106
5.3.3 Ventilation	106
5.3.4 Fire Safety and Security	107
5.3.5 Material and Finishes	107
5.4 Legal Planning Regulations	107
CHAPTER SIX	109
DESIGN PHILOSOPHY, CONCEPTUALIZATION AND PROPOSAL	109
6.1 Design Philosophy	109
6.2 Design Concept	109

110
110
111
112
113-122

## **List of Figures**

Figure 2.1: Architectural pattern in context of biophilic model	24
Figure 2.2: Aspects of Human Life That Affect Health & Wellness	25
Figure 2.3: Determinants of Health and Wellbeing	27
Figure 2.4: Interconnectedness between environmental and human health	29
Figure 2.5: Cook+Fox Architects' office in New York incorporating Nature in the s	pace35
Figure 2.6: Indoor Water fountain at Jewel Changi Airport, Singapore	36
Figure 2.7: The Esplanade Theatre, mimicking the durian plant	37
Figure 2.8: Paul Cocksedge's Living Staircase	38
Figure 2.9: Experience of Biophilic Design	39
Figure 2.10: An illustration of the process and effect of light on the human brain	41
Figure 2.11: Examples of fractals found in Nature	42
Figure 4.1: Site plan of Suzhou Children's Hospital	78
Figure 4.2: Aerial perspective of the Suzhou hospital façade showing the form	79
Figure 4.3 Entrance to the Suzhou Children's Hospital	80
Figure 4.4 Winding Stairs in Bendigo	79
Figure 4.5 High volume spaces in Bendigo	82
Figure 4.6: Bendigo Hospital's façade showing its highly reflective mirrors	83
Figure 4.7: Woven Timber Ceilings between the hospital's entrances	83
Figure 4.8: Location Distribution of Respondents	84
Figure 4.9: Gender Distribution of Respondents	86
Figure 4.10: User Category of Respondents	87
Figure 4.11: Users' colour preference	96
Figure 4.12: Map of Rivers state, showing Port Harcourt highlighted	98
Figure 4.13: Greater Port Harcourt new city masterplan	100
Figure 4.13: Greater Port Harcourt Phase 1A Design Plan showing hospital site	100
Figure 4.14: Showing climatic graph weather by month in Port Harcourt	103
Figure 4.15: Showing the average temperatures and precipitation in Port Harcourt	103
Figure 6.1: Land use plan design	114
Figure 6.2: Bubble diagram showing relationship between hospital units	115

#### **List of Tables**

Table 3.1: The sample frame across the four selected hospitals	50
Table 3.2: Determination of sample size from a population of 2330	52
Table 3.3: Operationalization of variables	53
Table 4.1: Extent of Biophilic Design Application in Federal Medical Center, Owerri	66
Table 4.2: Extent of Biophilic Design Application in Ace Medicare Clinics	70
Table 4.3: Extent of Biophilic Design Application in Eleme General Hospital	73
Table 4.4: Extent of Biophilic Design Application in RSUTH	77
Table 4.5: Extent of Biophilic Design Application in Suzhou Children's Hospital	80
Table 4.7: Gender Distribution of Respondents Per Hospital	85
Table 4.8 Age Range of Respondents	86
Table 4.9: Highest Educational Qualification of Respondents	88
Table. 4.10: Frequency of Hospital Visits	88
Table 4.11: Extent of users' familiarity with Biophilic concepts	89
Table 4.12: Users' perception of the impact of biophilic design principles on their healt	th
and wellbeing	91
Table 4.13: Mean loading of Variables in Descending order	94
Table 5.1: Spatial Program for the Administrative Unit	107
Table 5.2: Spatial Program for the Records and Documentation Unit	107
Table 5.3: Spatial Program for the In-Patients Department.	108
Table 5.4: Spatial Program for the Accidents & Emergency Department	108

### **List of Plates**

Plate 4.1: Accessible green courtyards in FMC Owerri	63
Plate 4.2: Windows in ward	64
Plate 4.4: Quadrilateral structures found in FMC, Owerri	64
Plate 4.5: Fractal patterns found in FMC, Owerri	65
Plate 4.6: Concealed	
corridor	64
Plate 4.7: High volumes	65
Plate 4.8: Courtyard in Ace Medical Center	68
Plate 4.10: Curves on the Ace Clinics façade	69
Plate 4.11: Curved ramp in Ace Clinics	69
Plate 4.12: Long Corridor in Ace Clinics	70
Plate 4.14: Courtyard in Eleme General Hospital	72
Plate 4.15: Hospital Ward in Eleme General Hospital	72
Plate 4.16: Sheltered walkway in Eleme General Hospital	73
Plate 4.17: Sheltered Walkway in Eleme General Hospital showing solar angle	73
Plate 4.18: External environment of RSUTH	75
Plate 4.19: Artificially lit Children's ward in RSUTH	75
Plate 4.20: Corridor in RSUTH	76
Plate 4.21: Walkway with hedges in RSUTH	76

	Appendices	
Appendix 1: Observation Guide		76
Appendix 2: Questionnaire for Use	ers1	29

**ABSTRACT** 

In response to the evolution and modification of human needs and priorities, the built

environment has evolved over time from simple unplanned dwellings to more complex

organized ones, and it has now been made obvious that man's basic need for shelter involves

more than just a roof over his head - it has become a foundation for his health and overall well-

being, even more so in hospital environments and healthcare facilities. Therefore, the need for

intentional design of healthcare facilities that can cater to the wellbeing needs of people,

passively, while performing its mainstream healthcare functions has arisen, especially in

Southern Nigeria where the black soot menace has plagued the air. One of the ways to achieving

this is by integrating nature into the environment and this approach is Biophilic Design which

uses nature in the space, nature of the space and natural analogues to improve wellbeing.

The aim of this research is to investigate the impact of biophilic design principles on human

health and wellbeing with a view to applying same to the design of a multi-specialist hospital

in Port-Harcourt, Rivers State, Nigeria. This study employed both quantitative and qualitative

research methods which include a questionnaire-based survey in 4 selected hospitals in Nigeria

and case studies of 6 selected hospitals to identify biophilic design strategies and the extent of

their application, as well as users' perception of the impact on their wellbeing. Findings show

that most hospitals in Nigeria are designed with minimal biophilic features and therefore only

moderately impacts on the wellbeing of their users. This study has developed an architectural

design of a multi-specialist hospital that employs biophilic design strategies to improve

wellbeing of the users.

Key Words: Biophilic Design, Wellbeing, Multi-Specialist Hospital, Port-Harcourt

xiv