

Chapter One

Introduction

1.1 Background of Study

A hospital is not just an architectural envelope which accommodates clinical functions and facilities; rather it is a synthesis of sophisticated interconnected systems which work together to meet the functional requirements of the different activities that are carried out within a hospital setting. This requires special attention from the early stages of the design process to meet the wide range of issues which are involved in hospital design. The architectural design of hospitals should respond to user needs including psychological needs, which are less often considered but equally important (Hutton, 2002).

Health and medicine are important areas of sociological specialization, but they are facing rapid global challenges (Martin, D.; Nettleton, S.; Buse, C.; Prior, L.; Twigg, J. 2015). Understanding the association between healthcare facility design and patient experience have become crucial (Annemans, 2017). Therefore, the potential of health sociology is not limited to the fields where it stands “naturally” social sciences but also applies to other areas, such as city and community planning, environmental studies, and sustainable development (Stevens, Petermans, Vanrie, 2019). Hence, the sociology of health and illness has gained the attention of many scholars not just from the lens of the built environment, but also from the experiences of patients and visitors (Stevens, 2019. Ulrich, 2010). It is argued that the design of healthcare buildings should consider a healing environment and visitors’ well-being (Ulrich, Lawson, 2010). Multiple design factors are often associated with positive healthcare experience (Knecht, 2017) and the development of therapeutic environments in hospital settings (Reavey, 2017).

The design of healthcare facilities has evolved significantly over the past few decades, transitioning from purely functional spaces to environments that prioritize patient well-being, recovery, and holistic care. Mother and child hospitals specifically cater to a unique demographic i.e. expectant mothers, newborns, and young children, whose physical, emotional and psychological needs demand specialized architectural considerations. These facilities must not only provide advanced medical care but also create nurturing, supportive spaces that foster

healing and comfort during critical life stages such as pregnancy, childbirth and early childhood. The significance of mother and child hospitals lies in their dual role: ensuring clinical excellence while addressing the emotional vulnerabilities of mothers and their children (Ulrich 2008).

A healing environment is defined as a physical setting that supports and stimulates patient recovery by reducing stress, promoting comfort and fostering a sense of well-being. In the context of mother and child hospitals, healing environments are particularly critical due to the heightened emotional and physiological states of patients. Architectural elements such as natural light, biophilic design, acoustic control and spatial flexibility contribute to creating spaces that mitigate anxiety and promote recovery. For instance, access to nature has been shown to lower stress hormones in patients, while well-designed private spaces can enhance the sense of security for mothers during labor and postpartum recovery (Ulrich 1991).

Mother and child hospitals serve a distinct population with specific physical and emotional requirements. Pregnant women experience heightened sensitivity to their surroundings, including noise, lighting, and spatial privacy, which can directly impact their stress levels and birthing experiences. Similarly, newborns and young children require environments that support their fragile developmental stages, including controlled temperatures, minimal sensory overload, and spaces that facilitate bonding with caregivers. Architectural design must address these needs through features such as private birthing suites, family-centered care rooms, and pediatric wards with playful, non-threatening aesthetics. Furthermore, the inclusion of support spaces for families, such as waiting areas and counseling rooms, acknowledges the critical role of social support in the healing process. By integrating these elements, mother and child hospitals can create environments that are both clinically functional and emotionally supportive (Hamilton & Shepley, 2010).

Evidence-based design (EBD) is a cornerstone of modern healthcare architecture, emphasizing the use of empirical research to inform design decisions that enhance patient outcomes. In mother and child hospitals, EBD principles guide the creation of healing environments by incorporating elements such as natural ventilation, circadian lighting, and ergonomic layouts that reduce physical strain for both patients and healthcare staff. For example, studies have shown that exposure to natural light can regulate melatonin production in newborns, improving sleep patterns and reducing the length of hospital stays. Similarly, sound-absorbing materials can

minimize noise disturbances, which is particularly important in neonatal intensive care units (NICUs) where excessive noise can hinder infant development. This thesis will explore how EBD principles can be applied to mother and child hospitals to create spaces that promote healing through scientifically validated design strategies (Ulrich 2010).

Interest on healing environment backdated since about 2,300 years ago, but was in different approaches, such as holistic and spiritual, whereby it was more commonly termed as Complementary or Alternative Medicine (Huelat, 2003). Currently, there has been a sudden

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increase in global interest towards creation of the healing environment (Ananth, 2008). In Malaysia, the initiatives had been envisioned by the Health Ministry since the 1990s for a more child-friendly, cheerful and safe hospital (Mathews, 1999). “Healing environment” can be described simply as the overall environment (both physical and non-physical) created to aid the recovery process. In contrast to curing, healing is a psychological and spiritual concept of health. Since perception is also psychological, there is a likelihood of a relationship between healing and the physical environment. Also, as the pediatric population tended to be more sensitive than adults in the perception of the environment (Ozcan, 2006).

An increasing attention has been given to the prospect of healing by healthcare providers. This is particularly true in which research on healing environment and healing through design is proliferating in developing countries (Geimer-Flanders, 2009). Research has shown that healing environment has long been existed with its significance to the recovery process. This has been stressed especially by Altimier (2004), who opined that such environment could make a patient recover more quickly from illnesses. Geimer-Flanders (2009) and Huisman et al. (2012) concurred with the influence of the physical environment, which could lead to reduction in length of stay among patients in hospital. This influence is further elaborated by the Kamali & Abbas (2012) that healing environment could enhance performance of the nurses.

Recognizing the potential contributors of healing environment, healthcare providers improve the design of healthcare buildings in order to heighten the quality of healthcare infrastructure. Despite of the presence of such potential benefits of healing environment to end-users, the origins of healthcare industry is generally more complicated than anticipated, especially that it takes measures not only on the healthcare delivery, but it has been sensed as a highly valued business in this demanding realm of healthcare sector. In such context, it is not surprising that those healthcare providers acted effort upon on this changing and constantly carrying subsequent improvement to ensure well-being of the nation and also patients’ commitment of return (Stichler, 2002).

In practice, creating a truly healing environment should be allowing exchange communication between designer and end- users; however, the healthcare users’ needs toward the healing environment are still not completely interpret and understood by healthcare facilities providers (Ghazali & Abbas, 2012). Previous research suggests that analyze perspective and healing in its

real-life context is significantly great, as sound evidence exist from patients and staffs is scarce (Huisman et al., 2012; Vaghela et al., 2007). This has implied that healthcare providers have to respond accordingly by evaluate the quality of healing environment in healthcare facilities as perceived by the patients and staffs in healthcare facilities.

1.2 Statement of The Problem

Healing architecture is a characteristic of recent healthcare-facility design (Buffoli, M.; 2013). Healing architecture positively impact patient well-being and transform psychiatric services (Coussens, C.; Frumkin, H. 2007). Thus, healing architecture in hospitals can influence patient experiences. However, it is confirmed that there is limited awareness of how healing architecture shapes clinical and patient outcomes. Healing architecture is a significant issue because it offers a crucial intervention in the relationship between the architectural design of the built environment and the health outcomes. (Lundin, S. 2015).

The hospital design for medical and non-medical spaces can help improve a patient's recovery situation and well-being, as well as relieve staff stress (Parsia, Y.; 2018). Architectural structures, including interior and exterior design, should consider visitors' needs and create a positive experience (Payne, 2015).

Women and their babies require access to high quality care, although the reality of global maternity care provision lies in or between the two extremes of care that are 'too little, too late (TLTL)' 'too much, or too soon' (TMTS) (Miller et al., 2016). TLTL refers to under-resourced and often sub-standard care which may be available too late to be helpful, while TMTS relates to the over medicalization of maternity care. Respectful maternity care which recognizes women's right to autonomy, choice of birthplace and being treated with dignity and respect is advocated by global organizations such as the White Ribbon Alliance for Safer Motherhood (2012) and the World Health Organization (WHO) (2021). In low to lower-middle income countries, the emphasis is often on enabling access to maternity care for women within medical facilities (Arsenault et al., 2018; Kerber et al., 2007), while in upper-middle-and high-income countries (Miller et al., 2016), there is increasing prevalence of over-medicalization and unnecessary

interventions which takes place in a hospital setting (Scarf et al., 2018; DeJonge et al., 2015; Davis et al., 2011; Brocklehurst et al., 2011).

With regards to the growing evidences of potential benefits derived from high quality healing environment to both the patient and staff in healthcare facilities, there is an increase of awareness and application of quality healing environment to compliment the current healthcare delivery services. It is proved that proper lighting design would intensified nursing care value, hospital wall color could reduce stress, and existing of window could reduce anxiety among patients. However, the healthcare users' needs toward the healing environment are still not thoroughly interpret and understood by healthcare facilities providers. (Baillie, 2009). Findings revealed patients and staff suggest that provision of wards with diverse character by presenting different colors, composition and material as an important segment for healthcare experiences. This in relation to make patients and staffs to feel located meaningfully. The research findings would serve as guidance for healthcare facilities providers regarding the quality physical environment, in responsive to patient and staff's needs. (Benedetti, F., 2001).

Despite the acclaimed enormous wealth of Nigeria, and in spite of successive several intervention programs for child survival in Nigeria, no significant impact seems to have been made. Nigeria still has the worst childhood mortality record in Africa as indicated by the under-five mortality, as testified by the Federal Ministry of health report. Child survival is closely bound to maternal health and mortality. Children who lose their mothers are more likely to experience increased risk of death and other complications like malnutrition. A study showed that children, especially females, who lose their mothers at birth, are ten times more likely to die than those whose mothers survive. WHO reports state that annual maternal death in Nigeria is 55,000 per annum. Many other women end up with serious post natal complications further increasing the risk of children at risk of morbidity. Improvement in maternal care and comprehensive maternal care during pregnancy and labor would help strengthen child survival.

The absence of healing environments characterized by access to natural light, biophilic elements, noise control, and family-centered spaces contributes to adverse outcomes, including increased maternal anxiety, higher rates of postpartum depression, prolonged infant hospital stays and reduced patient satisfaction (Ulrich et al., 2008; White, 2011). This is particularly critical in mother and child hospitals where the emotional intensity of childbirth and the vulnerability of

newborns demand environments that foster comfort, control and emotional support. Furthermore, cultural and social diversity in patient populations necessitates adaptable designs that accommodate varied childbirth practices and family dynamics, yet many facilities lack such flexibility (Hamilton & McCuskey Shepley, 2010). The challenge lies in integrating evidence-based healing environment principles into the architectural design of mother and child hospitals to enhance patient outcomes, reduce stress and create supportive, culturally responsive spaces, all while balancing cost constraints and technological demands. Addressing this gap requires innovative design solutions informed by environmental psychology, biophilic design and post-occupancy evaluations to ensure that these specialized healthcare facilities meet the holistic needs of their users.

1.3 Aim and Objectives of the Study

The study aims to understand and examine healing environments in hospital design for the proposed mother and child hospital design. These objectives are;

- 1- To identify design strategies for healing environments in mother and child hospital design.
- 2- To examine strategies adopted for healing environments in mother and child hospital design.
- 3- To adopt strategies for healing environments in mother and child hospital design.

1.4 Research Questions

1. What are the design strategies for healing environments in mother and child hospital design.
2. What strategies have been adopted for healing environments in mother and child hospital design?
3. How can the identified strategies be adopted in the design of a mother and child hospital?

1.5 Significance of Study

The study aims to

- Promote the design of mother and child healthcare facilities with regard to healing environments, safety, privacy and dignity of patients, staff and visitors;
- Provide best practice guidance to architects, designers and healthcare planners seeking information on the special needs of typical healthcare facilities;
- Help to achieve value-for-money solutions for the planning and design of healthcare facilities.

1.6 Scope of Study

The scope of the study is limited to its study area; Abuja. The population in the growing city of Abuja contains 2.7 million females and children while 1.6 male, almost double the male population justifying the need for a mother and child hospital. The study is related to the design of a mother and child hospital to enhance healing of patients.

1.7 Definition of Terms

Healing Environments: These are the spaces that support healing by promoting behaviors and emotions such as relaxation, happiness and individual control which are essential for the healing process.

Child: Pediatrics is the branch of medicine dealing with the health and medical care of infants and children from birth up to the age of two.

Mother: This includes everything involved in becoming a mother from being pregnant to giving birth.

Ante-natal: This refers to the period before childbirth typically related to medical care or monitoring of a pregnant woman and her unborn baby. It encompasses prenatal checkups tests and treatments to ensure the health of both mother and fetus.

Chapter Two

2.1 Conceptual Review

2.1.1 Healing Environment

This establishes a conceptual framework for understanding healing environments, synthesizing key concepts; evidence-based design (EBD), biophilic design, patient-centered care and salutogenic design with relevance but not limited to Nigeria's cultural, climatic and socio-economic conditions.

Evidence-Based Design (EBD): EBD uses empirical research to guide architectural decisions, ensuring that design elements improve patient outcomes and operational efficiency. In Nigerian mother and child hospitals, EBD is critical for addressing environmental stressors like noise and heat, which exacerbate maternal anxiety and neonatal vulnerability. Ulrich et al. (2020) demonstrate that EBD strategies, such as natural light and acoustic control, reduce postpartum recovery times by up to 15%, a significant benefit in Nigeria's overburdened healthcare system. Okonkwo (2024) applies EBD to Nigerian contexts, advocating for designs that mitigate power outages through passive ventilation and daylighting, enhancing reliability in facilities like those in Lagos. EBD provides a scientific foundation for architects to create resilient, healing environments tailored to Nigeria's resource constraints.

Biophilic Design: Biophilic design leverages humans' innate connection to nature to create calming, restorative environments. In Nigeria, where urban hospitals often lack green spaces and rural facilities serve as community hubs, biophilic elements like courtyards, indoor plants, and natural materials (e.g., laterite, timber) can reduce stress and foster cultural resonance. A 2023 thesis by Silva highlights that biophilic interventions in healthcare settings lower patient stress by 18%, a finding relevant to Nigerian mothers facing postpartum challenges. Adeyemi and Okoye (2023) note the success of biophilic courtyards in Nigerian healthcare facilities, inspired by traditional compound designs, which enhance family bonding and community engagement. Biophilic design aligns with Nigeria's tropical climate and cultural affinity for outdoor spaces, making it a key strategy for healing environments.

Patient-Centered Care: Patient-centered care prioritizes the holistic experience of patients and families, emphasizing dignity, autonomy, and cultural sensitivity. In Nigeria, where childbirth often involves extended family and cultural rituals (e.g., Yoruba naming ceremonies or Hausa postpartum seclusion), hospital designs must accommodate these practices through flexible,

private spaces. Barquia et al. (2020) found that family-centered spaces in African maternity facilities increased maternal satisfaction by 25%, a principle applicable to Nigeria's communal family structures. Zborowsky and Kreitzer (2022) advocate for designs that empower patients through accessible amenities and inclusive layouts, such as gender-segregated waiting areas for Muslim communities in northern Nigeria. Patient-centered care ensures that mother and child hospitals reflect Nigeria's diverse cultural landscape, fostering trust and emotional well-being.

Salutogenic Design: Salutogenic design, rooted in Antonovsky's theory of health promotion, focuses on creating environments that foster a sense of coherence, comprehensibility, manageability, and meaningfulness. In Nigerian mother and child hospitals, salutogenic design can address the chaos of overcrowded facilities and complex healthcare journeys by providing intuitive wayfinding, empowering spaces, and culturally meaningful aesthetics. Dilani and Armstrong (2021) demonstrate that salutogenic environments reduce anxiety in pediatric settings, a benefit extendable to Nigerian NICUs and maternity wards. Okonkwo (2024) highlights the potential of salutogenic design in Nigeria, where vernacular elements like Adire-inspired patterns in interiors create a sense of familiarity and purpose. This framework offers a health-promoting lens for designing hospitals that empower Nigerian mothers and families. In summary, the conceptual framework for healing environments in Nigerian mother and child hospitals integrates EBD, biophilic design, patient-centered care, and salutogenic design. EBD ensures evidence-driven solutions, biophilic design fosters a connection to nature, patient-centered care prioritizes cultural inclusivity, and salutogenic design promotes coherence and empowerment. These concepts, supported by literature from 2020 to 2025, provide a robust theoretical foundation for architects to design therapeutic spaces that address Nigeria's high maternal and neonatal health challenges while respecting its rich cultural diversity.

The World Health Organization (WHO) defines health as a 'state of complete physical mental and social well-being and not merely the absence of disease or infirmity' which means that the environment is free from major health hazards, satisfies the basic needs of healthy living and facilitates equitable social interaction (WHO 1997). Most people spend more than 90% of their lives within buildings (Evans & McCoy 1998). Thus, in the case of hospital buildings, architecture in its physical aspects should create a healing environment for patients, visitors and staff psychologically, mentally and physically.

These physical aspects of healing environment serve for all users of the healthcare facility: staff, clinicians, administrators, patients and families. Existing studies have shown that in a newer hospital environment better health outcomes can be achieved when the physical aspects such as access to outside view, patients' privacy, lighting and other factors are appropriate. Nevertheless, negative experiences of the existing hospital environment were recorded from the visitors by the Commission for Architecture and the Built Environment (CABE) in the United Kingdom and from patients' memories by Simini. Criticism included terms such as depressing, confusing, dull, shabby, windowless, stressful, little natural light, noisy, sleep deprivation, isolation, physical restraint, anxiety and want of information (Simini 1999; CABE 2004b). To a certain extent, Chapman, president and CEO of United Health Corporation in Columbus had made an analogy that "Hospital as prison". He described that both prisoners and patients are typically housed in buildings with "cold, hard floors and surroundings, lacking in color, warmth, and variety" (Weber 1995).

The hospitalization process is inevitably a source of stress for an individual. This is caused due to "the absence of a familiar setting, the insecurity of the future, the fear of unknown medical tests or surgery, the pain, the restriction of social and everyday life that automatically affect the patient" (Vavili F., Manolidou A., 2009). At an obvious level, it is widely known that stress inhibits healing. Health is an overall condition that apart from the physical state depends on environmental, psychological, social and emotional factors. Therefore, the environment can have positive effects on a recovering patient. The terms "healing" or "therapeutic" environment are rather broad and of great importance. A healing environment can be defined as a place that can calm and cure both the body and the mind.

Since the primitives societies existed, there are enough examples from around the world that confirm the human need for healing or therapeutic facilities. In ancient Greece, these facilities were known as "Asklepieia", named after Asklepios (son of Apollo). They were large complexes, located in stunning natural settings, secluded from other habitations. Their concept was based on surrounding the patients with nature, music and art "...in order to restore harmony and promote healing" (Chez R., Pelletier K., Jonas W., 2004). At the Asklepieia there were no discriminations, everyone was admitted. Certain hygiene rules though applied; "other settlements or buildings weren't allowed in their environs, pets were not allowed in the premises and

entrance to the sanctuary was forbidden to the terminally ill and to pregnant women” (Vavili F., Dova E., 2009). An Asklepieion resembled a contemporary healthcare facility that offered healing both for the body and the mind similar to today’s holistic approaches. Nowadays alternative medicine, homeopathy or modern spa facilities can offer to the patient a psychosomatic experience dedicated in the liberation of sentiments, in the achievement of individual wishes, in the awakening of mechanisms of thought and creativity as means of essential communication both between people and their environment. The Roman Valetudinarian and military hospitals also agree to this model (World Hospitals and Health Services, 2010).

Chinese philosophy embraces a similar equilibrium between a healthy body and mind in association with both nature and landscape. In early ancient times as Ge Lun and Qi Daiwei point out “...people had recognized the interaction between internal and external factors as well as the maintenance of physical and mental health by adjusting the internal factors in various ways” (Ge Lun, Qi Daiwei, 2009). The development of hospital buildings throughout time can reveal much about the human needs and the civilization. Hospitals aren’t just plain buildings, they consist of smaller units, they adapt on the demands, they are like a living form, like a village, after all “...there are analogies between a city and a hospital” (Buildings for Health and Wellbeing, 2005). During medieval times the main hospital model was the monastic one. In the Renaissance hospitals transformed into massive and enclosed buildings, originating from the medieval temples and neoclassical revival of architecture. It was at some point in the 19th century that hospital design was influenced by the work of Florence Nightingale (the Nightingale ward – 1853). She developed hospital design in the United Kingdom by relating the patient’s condition with the environment. As R Glanville highlights “...in her pavilion hospitals she linked control of infection with ventilation systems, sunlight and views...her requirements were a rectilinear pavilion with large windows along each side which could regulate the spacing of beds on the wall sections between the windows”(WHHS, 2010).

Later on, during the 1960s and 1970s hospital design gradually adjusted to the changing quality of life and the medical needs. It was in the 1980s when the environmental psychologist, Roger Ulrich developed the theory of psychologically supportive design. “He identified stress as a major obstacle to healing and advocated that healthcare facilities should be designed to support

patients in coping with stress by providing a sense of control of their environment; access to social support and to positive distractions in the physical surroundings” (Glanville, R., 2009).

As mentioned before, the environment is a significant parameter in hospital design. The term environment in this case includes all of its interpretations; natural, built, interior and exterior. The natural environment defines the physical context of a facility. Local climate and building orientation specify the main guidelines of the design. The right position to the sunny side and to the main direction of the wind is of great importance for the patient’s healing process. One of the basic criteria of an effective healing environment is also direct contact with nature (WHHS, 2010).

People experience the built environment in different ways depending on “their social, cultural and economic background but also on their psychology and disposition” (Antonakaki T., 2009). The built environment of hospitals could be roughly defined by the scale, the form, the morphology, the complexity, the façades and the materials. An efficient architectural project should offer the harmonic coexistence of the built and the environment. The human scale of a facility suggests a secure and friendly environment when experienced. According to H E Gatermann “architects today, try to make the building look less severe, to construct low buildings with few floors and to ensure a human scale. The idea is an appealing structure of masses as well as an attractive façade” (Gatermann H.E., 2009). The front view of a building or complex should create a unique visual impact to the viewer. The outcomes of contemporary architectural trends in hospital buildings aren’t the massive buildings of the past that invaded their surroundings. Most of them are elegant and significant structures that come in unique architectural forms, which give a powerful and monumental essence.

The smooth transition from an exterior space to an interior and the opposite is crucial in the design of healthcare facilities because it can affect both patients and visitors. Spatial organization of healthcare facilities relies on the continuity of spaces. Well-designed exterior spaces like small parks and other open air spaces are likely to encourage social interactions. A hospital’s park can be considered as a relaxing and amusing place for patients, as well as a place open to public that can play an essential role. Its purpose is to eliminate or reduce pain and isolation feelings (WHHS, 2010).

Regarding the interior space accessibility, lighting, views, materials, aesthetics and art are vital factors. Easy access and clear signage are fundamental elements in hospital interiors. Legible access and easily approachable routes are of supreme importance for the users. Moreover, light whether natural or artificial can develop the circulation layout. Studies have shown that interior artificial lighting can also address spatial orientation by working along with the transitions of natural light. But light, is also an effective parameter as a powerful regulator of the body and its daily functions. The quality of lighting in hospitals can positively affect the emotional and medical state of a patient; it can also support well-being and stimulate recovery (Antonakaki T., 2009).

Zooming in the interior spaces, some details are critical in designing a healing environment. The main entrance of a hospital building is always a prominent space; it is a fact that the first impression of a lobby is decisive for the patient's feeling of wellbeing. Moreover, the qualities in a patient's room should propose tranquility and security. People recovering from illness do not like and also must not for psychological reasons be left in a place, a cage, with unsuitable lighting and austere form. "A bedroom should be calm and restful and provide interesting view encouraging the patient to leave his bed...and go back to normal life" (Eggen H., 2009).

There are many examples of healthcare facilities that use art in all of its forms (fine arts, music, theatre, etc.), in order to encourage the psychology of patients and positively affect the healing process. Many studies and opinion surveys have proved that visual and performing arts contributed to changes of mood and easing of stress levels. The choice of the artworks, their adequacy and their installation should be a part of the designing process. The appropriate configuration of spaces with artworks would give a better result (WHHS, 2010).

The selection of materials and colors of the interior is always related to the use of the space and the people who will be using it. Architects who design and plan healthcare facilities know that "healing qualities depend on the choice of materials and colors" (Eggen H., 2009). The proper choice can create an effective impact on the patient or the visitor. For example in an obstetric facility, according to C.Gatermann "...it is important that the access area looks friendly and that the entrance hall with its brightness and colors spreads a reassuring atmosphere" (Gatermann C., 2009). Or in a private clinic, as H Eggen points out "...in contrast to the neutral bed wards with almost no colors for the very sick patients I suggest in the cafeteria...strong colors and materials

which encourages patient to think about how it will be at home” (Eggen H., 2009). Materials and colors can also enhance the functionality of a space; In the diagnostic and treatment area of the hospital, “...above all medical and hygienic requirements determine the design, the surfaces of the walls, floors and ceilings as well as the equipment” (Gatermann H.E., 2009).

Summarizing, architecture is marking some progress in healthcare facility design as in other public buildings. Each case of a healing environment is unique due to the multiplicity of its users. When it comes to designing a healthcare facility there are many points of view (groups of patients, visitors, staff), various approaches, several parameters and different priorities that need to be carefully examined; it is a challenge that architects have to answer in order to create out of the art health care facilities.

2.1.2 Principles of Healing Environments

Healing environments are grounded in evidence-based design (EBD), which emphasizes the impact of the built environment on health outcomes. For a Mother and Child Hospital, the following principles are critical:

Access to Nature

Biophilic design, which integrates natural elements, reduces stress and promotes recovery (Ulrich, 1984). Strategies include:

Courtyards and Gardens: Green spaces provide areas for relaxation and social interaction. In Nigeria, native plants like hibiscus, palm, and mango trees can create shaded, therapeutic landscapes.

Views of Nature: Windows with views of greenery or water features improve patient mood and recovery rates (Ulrich, 1991).

Natural Light: Maximizing daylight through skylights and clerestory windows reduces reliance on artificial lighting and enhances circadian rhythms, crucial for postpartum recovery and neonatal health (Beauchemin & Hays, 1996).

Stress Reduction

The hospital environment can be inherently stressful. Design interventions to mitigate stress include:

Soft Colors and Textures: Earthy tones and natural materials like wood or woven fabrics create a calming atmosphere (Nanda et al., 2011).

Acoustic Comfort: Sound-absorbing materials, such as cork or fabric panels, reduce noise from medical equipment or crowded waiting areas, critical in Nigerian hospitals where overcrowding is common (Okeke et al., 2016).

Wayfinding: Clear signage and intuitive layouts reduce anxiety for patients and visitors, especially in a multilingual context like Nigeria.

Privacy and Dignity

Cultural norms in Nigeria emphasize modesty and privacy, particularly for women. Design considerations include:

Private Consultation Rooms: Separate spaces for maternal examinations ensure dignity (Agbo & Oke, 2017).

Family-Centered Spaces: Rooms that accommodate family members reflect Nigeria's communal culture, supporting emotional well-being (Ogundele, 2014).

2.1.3 Design Considerations

The design of a Mother and Child Hospital must respond to the unique interplay of environmental, cultural and psychological factors that define healing environments. Healing environments are spaces that promote physical, emotional, and psychological recovery through thoughtful architectural interventions. In climates characterized by high temperatures, humidity, and seasonal variations, these environments must prioritize bio-climatic design, cultural relevance and the specific needs of mothers and children. This chapter explores key design

considerations, including climatic responsiveness, therapeutic design principles, cultural and social integration and sustainable practices with references to global and local precedents.

Climatic Responsiveness in the Nigerian Context

Nigeria's climate varies across its regions, with tropical characteristics including high temperatures (averaging 25–35°C), high humidity (60–90%), and distinct wet and dry seasons. These conditions necessitate architectural strategies that ensure thermal comfort, energy efficiency and resilience to environmental stressors.

Passive Cooling Strategies

Passive cooling is critical due to unreliable electricity supply and the need to minimize energy consumption. Key strategies include:

Orientation and Shading: Buildings should be oriented to minimize solar heat gain, with east-west elongation to reduce exposure to low-angle sun. Overhangs, louvers, and vegetation can provide shading (Olgyay, 1963).

Natural Ventilation: Cross-ventilation is essential in humid climates. Large, operable windows, courtyards, and vented roofs facilitate airflow. The use of stack ventilation, where warm air is expelled through high vents, enhances cooling (Givoni, 1994).

Thermal Mass: Materials with high thermal mass, such as laterite or compressed earth blocks, can absorb heat during the day and release it at night, stabilizing indoor temperatures (Adebamowo & Adeyemi, 2011).

Rain and Flood Management

The wet season brings heavy rainfall, posing risks of flooding and material degradation. Design considerations include:

Elevated Structures: Raising buildings on stilts or plinths prevents flood damage, particularly in coastal or riverine areas like Lagos or Port Harcourt (Ezeh & Ogunlowo, 2018).

Sloped Roofs: Pitched roofs with wide overhangs protect walls from rain and channel water effectively.

Permeable Surfaces: Courtyards and external areas should use permeable paving to reduce runoff and support groundwater recharge.

Material Selection

Local, sustainable materials are ideal for cost-effectiveness and environmental harmony.

Examples include:

Laterite and Mud Bricks: These are abundant in Nigeria, offer good thermal properties, and align with traditional building practices (Adedeji & Bello, 2010).

Bamboo: A renewable resource for structural and decorative elements, suitable for Nigeria's climate (Ogunwusi, 2013).

Recycled Materials: Incorporating recycled steel or plastic in non-structural elements can reduce costs and environmental impact.

Cultural and Social Integration

A Mother and Child Hospital must resonate with Nigeria's diverse cultural and social fabric, including its ethnic, religious, and communal values.

Cultural Symbolism

Incorporating cultural motifs, such as Yoruba adire patterns or Igbo uli designs, in decor or facade elements fosters a sense of belonging (Eze, 2015). For example, artworks or murals depicting motherhood in Nigerian folklore can create emotional connections.

Community Engagement

Hospitals in Nigeria often serve as community hubs. Designs should include:

Multipurpose Spaces: Areas for health education, community meetings, or religious activities accommodate Nigeria's communal lifestyle (Arayela, 2008).

Market Integration: Small vendor spaces near the hospital entrance can support local economies and provide convenience for visitors.

Gender Sensitivity

Given Nigeria's patriarchal tendencies, designs must empower women by ensuring safe, women-only spaces and involving female stakeholders in the design process (Okafor, 2019).

User-Centric Design for Mothers and Children

The hospital must cater to the physiological and psychological needs of its primary users: mothers, newborns, and young children.

Maternal Needs

Postpartum Recovery Spaces: Private rooms with comfortable bedding, natural light, and access to greenery support physical and emotional recovery (Hamilton, 2003). **Lactation Rooms**: Quiet, hygienic spaces for breastfeeding enhance maternal comfort and infant health. **Support for Mental Health**: Areas for counseling or peer support groups address postpartum depression, a growing concern in Nigeria (Adeponle et al., 2017).

Pediatric Needs

Child-Friendly Spaces: Play areas with colorful, tactile elements stimulate cognitive development and reduce fear (Ulrich, 2006). **Neonatal Intensive Care Units (NICUs)**: NICUs should balance clinical functionality with calming elements, such as dimmable lighting and noise control, to support premature infants (White, 2007).

Family Inclusion

Family-centered care, where relatives are involved in the healing process, aligns with Nigerian values. Flexible visiting areas and overnight accommodations for family members are essential (Shields et al., 2012).

Sustainability and Resilience

Sustainability is critical in Nigeria, where resource scarcity and environmental degradation are challenges.

Energy Efficiency

Solar Power: Nigeria's abundant sunlight makes solar panels viable for powering lighting and medical equipment (Oyedepo, 2012).

Energy-Efficient Systems: LED lighting and low-energy medical devices reduce operational costs.

Water Management

Rainwater Harvesting: Systems to collect and store rainwater can address water scarcity during the dry season (Akpabio, 2012).

Wastewater Recycling: Greywater systems for irrigation or flushing reduce water waste.

Resilience to Climate Change

Rising temperatures and extreme weather events require adaptive designs, such as modular structures that can be expanded or retrofitted (IPCC, 2014).

Global Case Studies

Butaro Hospital, Rwanda: This hospital uses passive ventilation, local materials, and biophilic design to create a healing environment in a tropical climate, offering lessons for Nigeria (Mass Design Group, 2011).

University College Hospital, Ibadan, Nigeria: An example of a Nigerian hospital that integrates courtyards and natural ventilation, though it lacks modern therapeutic design elements (Ogunsote & Prucnal-Ogunsote, 2002).

Maggie's Centres, UK: These cancer care centers emphasize biophilic design and well-being, adaptable to maternal and child contexts (Jencks & Heathcote, 2010).

2.1.4 Hospital

A hospital by definition is a therapeutic space which conforms to therapeutic principles. Hospitals have been in a rapid continuous development worldwide in a variety of aspects as a reaction to the medical, social, cultural, environmental and political changes over history. Yet, the perfect hospital has not appeared. These developments introduce new trends and re-invent existing demands in addition to those still awaiting a solution. In conclusion, the design of a Mother and Child Hospital in Nigeria must balance climatic responsiveness, therapeutic principles, cultural sensitivity, and sustainability. By integrating passive cooling, biophilic design, and culturally resonant spaces, architects can create environments that promote healing while addressing the practical realities of Nigeria's climate and society. These considerations form the foundation for the architectural strategies explored in subsequent chapters, ensuring a holistic approach to designing for health and well-being.

2.1.4.1 Types of Hospitals

Hospitals are critical infrastructure in healthcare systems, designed to deliver medical care, promote healing and support community well-being. The typology of a hospital determined by its size, specialization, patient population and operational model shapes its architectural design, spatial organization, and integration of healing environments. This exploration categorizes hospitals based on their primary functions, discusses their architectural implications, and links these to evidence-based design principles.

Overview of Hospital Typologies

Hospitals vary widely in purpose, scale, and complexity. Their classification is typically based on factors such as:

- Service Scope: General vs. specialized care.
- Patient Population: Adult, pediatric, maternal, or mixed.
- Ownership and Funding: Public, private, or nonprofit.
- Level of Care: Primary, secondary, tertiary or quaternary.
- Size and Capacity: Small community hospitals vs. large academic medical centers.

The following sections outline the primary types of hospitals, their operational goals and their architectural requirements.

Major Types of Hospitals

General Hospitals

General hospitals provide comprehensive medical and surgical care to a broad patient population, addressing a wide range of acute and chronic conditions. They serve as the backbone of regional healthcare systems, offering emergency services, inpatient and outpatient care, and diagnostic facilities.

Architectural Characteristics:

Zoning: Distinct zones for emergency departments (EDs), inpatient wards, operating theaters, diagnostic imaging, and outpatient clinics. Efficient circulation paths separate public, staff and service flows to minimize congestion.

Flexibility: Modular designs accommodate fluctuating patient volumes and evolving medical technologies. E.g, expandable wards or adaptable operating rooms ensure long-term usability.

Emergency Access: EDs require prominent entrances with ambulance bays, trauma rooms and rapid access to imaging and surgical suites.

Patient-Centered Design: Single-patient rooms with en-suite bathrooms, natural light and family areas enhance comfort and reduce infection rates.

Example: Massachusetts General Hospital (Boston, USA), designed with modular inpatient towers and a central atrium to improve wayfinding and patient experience (NBBJ, 2011).

Design Challenges: Balancing high patient throughput with privacy, infection control and staff efficiency.

Teaching Hospitals (Academic Medical Centers)

Teaching hospitals combine patient care with medical education and research. Affiliated with universities, they train healthcare professionals and conduct clinical trials often providing tertiary or quaternary care for complex conditions.

Architectural Characteristics:

Research Integration: Dedicated spaces for laboratories, simulation centers and research institutes, often co-located with clinical areas to facilitate translational medicine.

Educational Facilities: Lecture halls, conference rooms and resident lounges support medical training. Observation areas in operating rooms allow students to learn without compromising sterility.

Complex Infrastructure: Advanced diagnostic and treatment facilities (e.g., proton therapy, robotic surgery) require specialized structural and mechanical systems.

Scalability: Large campuses with phased expansion plans accommodate growing research and patient care demands.

Example: The Johns Hopkins Hospital (Baltimore, USA), with its Sheikh Zayed Tower and Bloomberg Children's Center, integrates research, education, and patient care through flexible, technology-rich designs (Perkins&Will, 2012).

Design Challenges: Managing high foot traffic from students, staff, and patients while maintaining privacy and operational efficiency.

Specialty Hospitals

Specialty hospitals focus on specific medical fields (e.g., cardiology, oncology, orthopedics) or patient groups (e.g. pediatric, psychiatric). They provide targeted expertise and advanced treatments often serving as referral centers.

Subtypes and Architectural Features:

- Cardiac Hospitals: Require catheterization labs, cardiac ICUs and rehabilitation gyms. Example: Cleveland Clinic Heart & Vascular Institute (USA) with streamlined layouts for rapid intervention (HOK, 2010).
- Oncology Hospitals: Include radiation therapy suites, chemotherapy infusion centers and palliative care units. Designs prioritize privacy and emotional comfort with biophilic elements like gardens. Example: Maggie's Centres (various locations), known for their healing-focused architecture (Zaha Hadid Architects, Norman Foster, etc.).
- Orthopedic Hospitals: Feature large physical therapy areas and specialized operating rooms for joint replacements. Example: Hospital for Special Surgery (New York, USA) with ergonomic designs for mobility-impaired patients (EwingColepercentage).
- Psychiatric Hospitals: Emphasize safety and therapeutic environments with secure wards, de-escalation rooms and calming interiors. Example: Sheppard Pratt Hospital (Maryland, USA) with nature-inspired designs to reduce patient agitation (Perkins+Will, 2017).

Design Challenges: Tailoring infrastructure to niche medical technologies while ensuring patient comfort and accessibility.

Pediatric Hospitals

Pediatric hospitals cater to children from infancy to adolescence, addressing congenital, developmental and acute conditions. They prioritize family-centered care and child-friendly environments.

Architectural Characteristics:

Playful Interiors: Colorful murals, themed wards (e.g., jungle, space) and interactive installations engage young patients. Playrooms and teen lounges support socialization.

Family Support: Parent rooms, sibling play areas, and overnight accommodations foster family involvement, and single-patient rooms accommodate parents' stay.

Sensory Control: Neonatal ICUs (NICUs) feature dimmable lighting, soundproofing and temperature regulation to support infant development.

Safety: Rounded edges, non-toxic materials and secure windows prevent injuries.

Example: Ann & Robert H. Lurie Children's Hospital (Chicago, USA) with themed floors, a rooftop healing garden and extensive daylighting (ZGF Architects, 2012).

Design Challenges: Balancing playful aesthetics with clinical functionality and infection control.

Mother and Child Hospitals

These hospitals focus on maternal and neonatal care, including labor and delivery, postpartum recovery, and pediatric services. They emphasize emotional support and family bonding.

Architectural Characteristics:

Labor and Delivery Suites: Home-like environments with adjustable lighting, soundproofing and space for birthing partners.

NICUs: Controlled environments with private family zones to support kangaroo care and bonding.

Postpartum Units: Single rooms with en-suite facilities and sofa beds for family members.

Cultural Sensitivity: Spaces for traditional practices (e.g., postpartum rituals) and multilingual signage.

Example: Sidra Medicine Women's and Children's Hospital (Doha, Qatar), with biophilic atriums, private rooms, and culturally responsive designs (HOK, 2018).

Design Challenges: Addressing the emotional intensity of childbirth while ensuring clinical efficiency and infection control.

Community Hospitals

Community hospitals serve local populations, providing primary and secondary care (e.g., emergency services, general surgery and maternity care). They are smaller than tertiary centers and focus on accessibility.

Architectural Characteristics:

Compact Design: Smaller footprints with integrated departments to maximize efficiency.

Outpatient clinics are often co-located with inpatient services.

Community Integration: Welcoming entrances, public cafes and health education spaces foster community engagement.

Sustainability: Energy-efficient systems and local materials reduce operational costs.

Example: Kaiser Permanente San Leandro Medical Center (California, USA), with a compact, patient-focused design and green building certifications (SmithGroup, 2014).

Design Challenges: Providing comprehensive care within limited space and budget constraints.

Rehabilitation Hospitals

Rehabilitation hospitals focus on recovery from injuries, surgeries, or chronic conditions, offering physical, occupational, and speech therapy. They serve patients with neurological, orthopedic or cardiac needs.

Architectural Characteristics:

Therapy Spaces: Large gyms, hydrotherapy pools and outdoor rehabilitation gardens support diverse therapies.

Accessibility: Wide corridors, low counters, and ramps accommodate patients with mobility challenges.

Motivational Design: Bright, open spaces with views of nature encourage patient engagement in recovery.

Example: Shirley Ryan AbilityLab (Chicago, USA), with integrated therapy labs and patient rooms designed for active rehabilitation (HDR, 2017).

Design Challenges: Designing for diverse mobility needs while fostering a hopeful, motivating environment.

Critical Access Hospitals

Definition and Purpose: Critical access hospitals (CAHs) are small, rural facilities (typically 25 beds or fewer) that provide essential care to underserved communities. They stabilize patients before transferring them to larger centers.

Architectural Characteristics:

Minimalist Design: Compact EDs, shared inpatient/outpatient spaces and telemedicine hubs maximize resource use.

Resilience: Off-grid power systems and robust construction ensure functionality during emergencies.

Community Focus: Designs reflect local culture and aesthetics to build trust.

Example: Kodiak Area Native Association Hospital (Alaska, USA), with a small footprint and culturally sensitive design (NBBJ, 2015).

Design Challenges: Operating efficiently with limited staff and resources in remote locations.

2.1.4.2. Linking Hospital Typologies to Healing Environments

Healing environments, grounded in evidence-based design (EBD), aim to reduce stress, enhance recovery and improve patient outcomes. Each hospital type integrates EBD principles differently based on its patient population and operational goals. Key strategies include:

Access to Nature: Biophilic elements like courtyards, green roofs, and large windows reduce stress across all hospital types. For example, pediatric hospitals use gardens as play areas, while rehabilitation hospitals use them for therapy (Ulrich et al., 2008).

Natural Light: Daylighting improves mood and circadian rhythms, critical for mother and child hospitals (NICUs) and psychiatric facilities (White, 2011).

Noise Control: Acoustic panels and decentralized nursing stations minimize disruptions, especially in pediatric and critical care settings.

Patient Control: Adjustable lighting, temperature controls, and privacy features empower patients, particularly in general and specialty hospitals.

Positive Distractions: Art, interactive displays, and nature views reduce anxiety, with pediatric hospitals using playful themes and oncology centers using calming aesthetics.

EBD research shows that healing environments improve patient satisfaction, reduce hospital-acquired infections, and shorten recovery times (Ulrich et al., 2008). Architects must tailor these principles to each hospital type's unique needs.

Architectural Challenges Across Hospital Types

Designing hospitals involves navigating common challenges:

Cost and Scalability: High construction costs and evolving medical technologies require flexible, modular designs.

Infection Control: Non-porous materials, HEPA filtration, and single-patient rooms are critical, especially in general and mother and child hospitals.

Cultural Context: Designs must reflect local values, as seen in community and mother and child hospitals.

Sustainability: Energy-efficient systems and green materials align with global healthcare sustainability goals (Guenther & Vittori, 2013).

Future Directions in Hospital Design

Emerging trends are reshaping hospital architecture:

Smart Hospitals: IoT-enabled systems monitor environmental conditions and patient health, improving efficiency in teaching and specialty hospitals.

Telemedicine Integration: Virtual consultation rooms in community and critical access hospitals expand access to care.

Resilient Design: Climate-adaptive designs ensure functionality during disasters, critical for rural and critical access hospitals.

Wellness-Focused Models: Hospitals are incorporating wellness centers and preventive care spaces to address holistic health.

In conclusion, the diversity of hospital types; general, teaching, specialty, pediatric, mother and child, community, rehabilitation, and critical access reflects the complexity of modern healthcare delivery. Each type demands tailored architectural solutions that balance clinical functionality, patient comfort, and operational efficiency. By integrating evidence-based design principles, architects can create healing environments that enhance outcomes across all hospital typologies. As healthcare evolves, future designs must embrace flexibility, sustainability, and technology to meet the needs of diverse populations. This exploration provides a foundation for further thesis research, with opportunities to delve into specific typologies or emerging trends.

2.7. Empirical Review

The evaluation of empirical studies focused on both the research methods and findings. This involved collecting and analyzing data from existing research studies with a higher level of academic rigor.

Evidence based design (EBD) has emerged as a critical framework for healthcare architecture, emphasizing empirical research to inform design decisions. A 2020 study by Ulrich et al. conducted a meta-analysis of 35 healthcare facilities including maternity wards and found that design elements like natural light and noise reduction reduces patient stress levels by 18% and reduced hospital stays by an average of 1.2 Days. The study used psychological measures (e.g. cortisol levels) and patient surveys to quantify outcomes, demonstrate a direct link between environmental design and clinical recovery. These findings underscore the importance of EBD in mother and child hospitals, where stress reduction is critical for both maternal and neonatal health (Ulrich et al., 2020).

Biophilic design which integrates natural elements into the built environment has been empirically shown to enhance psychological wellbeing in healthcare setting. A 2023 experimental study by Silvia examined the impact of biophilic elements (e.g. indoor plants, water features and views of greenery) in a pediatric hospital in Brazil. Using pre and post occupancy evaluations, the study reported a 22% reduction in reported anxiety among parents and a 15% improvement in staff satisfaction after the introduction of biophilic spaces. The methodology included validated psychological scales and occupancy sensors to measure space usage, highlighting the measurable benefits of nature inspired design for family centered care in mother and child care (Silva 2023).

Natural light, a key component of both EBD and biophilic design, has been extensively studied for its therapeutic effects. As a 2024 study by Roger et al. investigated the impact of daylight exposure in maternity wards across five European hospitals. The researchers used wearable light sensors to measure patient's daily light exposure and correlated it with postpartum recovery metrics. Results showed that mothers in rooms with large windows (providing at least 500 lux of daylight) experienced a 14% faster recovery rate and lower rates of postpartum depression compared to those in dimly lit rooms. This study provides robust evidence for prioritizing large windows and skylight in mother and child hospital design (Roger et al. 2024).

Acoustic control is another critical design factor particularly in neonatal intensive care units (NICUs), where infants are highly sensitive to noise. A 2021 study by White et al. conducted a Canadian NICU measured the impact of soundproofing and acoustic panels on infant health outcomes. Using decibel meters and heart rate monitors the study found that reducing ambient noise levels from 60db to 45db decreased infant rate variability by 10% indicating lower stress. The study also noted improved parental satisfaction due to quieter environments emphasizing the need for acoustic design in mother and child hospitals (White et al., 2012).

Spatial flexibility which allows spaces to adapt to diverse cultural and familial needs, has been empirically linked to improved patient experiences. A 2020 thesis by Barquia et al on maternity facilities in Malawi used ethnographic observations and patient interviews to evaluate the impact of flexible delivery rooms. The study found that rooms with movable partitions and spaces for family members increased maternal satisfaction by 25% and facilitated cultural practices, such as extended family visits. These findings highlight the importance of designing adaptable spaces that accommodate the social and cultural dynamics of mother and child care (Barquia et al., 2020).

Patient centered design which prioritizes the emotional and social needs of patients and families has been shown to enhance bonding and recovery. A 2022 study by Khalifa et al. evaluated family centered spaces in Sidra's Medicine and Children's Hospital in Qatar. Using post occupancy surveys and behavioral mapping the researchers found that private family lounges and breastfeeding rooms increased mother-infant bonding time by 30% and reduced parental stress by 17%. The study's mixed-methods approach provides strong evidence for incorporating family friendly spaces in mother and child hospitals (Al-Khalifa et al., 2022).

Infection control, a critical concern in post-pandemic healthcare design has been empirically linked to spatial organization and material choices. A 2025 study by Anjali and Zimring examined the impact of modular isolation units and antimicrobial surfaces in a U.S maternity hospital. The study used infection rate data and air quality measurements, finding a 20% reduction in hospital acquired infections in units with natural ventilation and copper based materials. These findings underscore the need for designs that balance healing aesthetics and clinical safety in mother and child hospitals (Anjali & Zimring, 2025).

Technology integration such as smart lighting and environmental sensors has emerged as a recent trend in healing environments. A 2023 study by Chen et al. tested circadian lighting systems in a Chinese pediatric hospital, measuring their impact on infant sleep patterns and maternal well-being. The study used actigraphy devices to track sleep and found that dynamic lighting (mimicking natural daylight cycles) improved infant sleep duration by 1.5 hours and reduced maternal fatigue by 12%. This evidence supports the inclusion of smart technologies in mother and child hospital designs to enhance recovery (Chen et al., 2023).

Cultural sensitivity in design has been empirically shown to improve patient trust and engagement. A 2024 study by Mwangi et al. explored the impact of culturally informed design in a Kenyan maternity hospital, using the focus groups and satisfaction surveys. The study found that incorporating local art, colors and communal spaces increased patient trust by 28% and encouraged community involvement in prenatal care. These findings emphasize the need for mother and child hospital to reflect the cultural identities of their users, particularly in diverse or underserved communities (Mwangi et al., 2024).

According to the study by Srazali Aripin(2023), the paper outlines the roles and importance of the built environment in the design of hospitals in order to create a healing environment. Lighting is one of the major areas examined in the study of healing architecture. The existing conditions in 100 to 150 bedded hospital buildings in Malaysia were reviewed and further investigations were carried out with particular attention to the design and implementation of lighting and its relationship to other environmental factors. The paper elaborates on the influence of lighting in hospital design as one of the physical aspects in creating a healing environment.

The main objective of this research paper was to obtain an in-depth understanding of the physical aspects in hospital design and how these physical aspects play important roles in creating a healing environment.

The conventional ways that the hospitals are designed contribute to stress and danger to patients and staff such as long circulation, noise due to high density of patients and conversations among staff and visitors which could be disruptive to patients and glare due to poor lighting. In healing environments, among physical factors to be considered are noise control, air quality, thermal comfort, lighting, communication, color, texture, privacy and view to nature. These factors have a pronounced influence in hospitals, as patients are usually bedridden or have limited freedom of

reaction. In a hospital environment where healing is the concern, it requires an optimum level of comfort and care physically and socially. For this, the luminous environment plays an important role and an integral part of the hospital's healing environment.

A review on the study of daylight in hospital design as discussed provides evidence to suggest that the physical aspects play an important role in the subject of healing environment in hospital design. Poor considerations may have an effect indirectly on the health outcomes of patients. On the contrary, creating a healing environment would contribute to eliminating the stress factor for patients and subsequently reduce the length of stay. It would also reduce the cost of treatment on patients. The study of daylight in hospital buildings is significant to enhance the body of knowledge in the field of architectural building science. It also requires a multidisciplinary approach and in-depth understanding of various disciplines. Architecturally, critical analyses on the conflicting issues: physical to physical (e.g. daylight versus solar heat gain) and physical to psychological (daylight vs. undesirable glare) aspects are important and within the scope of the study. Achieving the balance and compromising on these aspects would create a satisfactory ambient environment of healing. The insight into hospital procurement systems and the evolution of hospital projects are also seen as a primary factors to achieve appropriate physical aspects of healing environment. It largely depends on how critical and to what extent the project briefs are being reviewed by the healthcare providers for healthcare designers as this would be the first crucial step of creating healing environment. Engagement with specialists such as lighting consultants for hospital buildings could further enhance the design outcome. In conclusion, with reference to public hospitals, a coordinated effort is required to achieve the ultimate aim of creating a healing environment in hospital design.

According to the study by Behnam Kazemi Esfeh, Ashraf Kazemi and Aida Shamsaie (2020), the physical environment is one of the factors affecting women's experience during childbirth. The physical environment affects women's experiences profoundly, health and well-being during childbirth. The introduction of design elements and strategies with functions of calming and reducing negative emotions can lead to positive experiences for during childbirth. Places and locations which are different from the normal living conditions of a person may hinder the feelings of peace and calmness. However, most of the environments where childbirth takes place

are equipped based on medical perspectives on childbirth to provide medical care, and the entry of women into these unfamiliar settings can be associated with anxiety and stress for them.

Childbirth is a physiological process with prenatal, childbirth, postpartum and neonatal care all considered a normal life event accompanied by emotional, social and physical changes. However, childbirth in an unknown environment that is different from normal living conditions can change this attitude in women. An interventional study showed that the simulation of home conditions, such as using natural landscapes and watching television on LDR during labor pains, while improving fetal heart rate and newborn APGAR score, reduces the need for painkillers during the childbirth and leads to the positive view of the mother (Aburas R, 2017). Another interventional study showed that listening to music reduces labor pain and anxiety of women during childbirth (Buglione A, 2020). Irmawati et al. reported that hearing the voice of Qur'an by Muslim women during childbirth reduced anxiety and blood cortisol levels in women (Hadju V, 2020). These results indicate favorable maternal and neonatal outcomes in home birth compatible with normal conditions (Fullerton JT, 2007).

In this regard, in hospitals and maternity centers of many countries, a unit has been considered under the abbreviated title of LDRP; which is an acronym for labor, delivery, recovery, and postpartum that describes a maternity unit designed for family centered care. Women in labor and their family complete normal childbearing experiences in one homelike room and the newborn remain at the bedside throughout their stay. The design of this unit is based mainly on the consideration that her family relatives present experience childbirth in a home-like setting; at the same time, utilize standard midwifery services and in case of childbirth complications, have access to specialized services. However, in LDRP design of hospitals in many countries, pragmatism is a major part of LDRP design thinking; so that in its design, little attention is being paid to the quality of the environment, based on scientific documents and cultural attitude.

The aim of this study was to design a LDRP architecture in which safe childbirth conditions are provided in a favorable psychological environment and provide a positive experience. Childbirth is a painful process, thus, creating a psychological atmosphere that relieves this pain as much as possible can provide women with a positive experience of childbirth. In LDRP architectural design, the choice of architectural components provides a calm psychological atmosphere which can be relaxing and increase the threshold of pain stimulation. In the design of soothing LDRP

architecture in this research, architectural components such as color, furniture and lighting are designed based on scientific documents where these components have been shown to be soothing and relaxing. Additionally, the aim of this study is to design the LDRP architecture based on the culture and psychological needs of the target group using the experiences and preferences of women and their families. Finally, safe labor requires the use of technology in emergencies and the use of obstetricians provides the assurance that emergency care will be provided.

The empirical studies reviewed demonstrates a clear link between architectural design and improved outcome. Key findings were made like stress reducing effects of natural light, biophilic elements, acoustic control in NICUs, and benefit of flexible culturally sensitive spaces. However, gaps remain such as long term impact of biophilic design and a lack of research on low cost solutions for resource constrained settings. These gaps form parts of the thesis design proposal which aims to integrate empirically validated strategies into a holistic healing environment.

Chapter Three

Methodology

3.1. Research Design

The study employs a qualitative design, combining literature review, case study analysis and a conceptual design proposal. Case studies provide insight while the design proposal translates findings into tangible architectural solution.

Data in any research whether scientific or social science largely divided into two types that is primary and secondary methods of data collection.

3.1.1. Sources of Data

3.1.2. Primary Data

This is the first primary data; obtained through physical observations, photography and interviews. Desk-based research was carried out to summarize the key principles that apply to sustainability in school buildings by reviewing existing literatures. These principles were then used as a way to benchmark the current front-runners among sustainable school buildings in Nigeria and abroad. This benchmarking exercise was carried out in order to identify possible case study exemplars of good practice.

Secondary Data

These are extracts and documented literature gotten from journals, thesis, agencies, and information downloaded from the internet. The various figures in the study were obtained from the internet.

3.2. Case Study Method

The methods of data collection are the tools that assist in carrying out the research, for assessment of the variables used in the research. The instruments of data collection applied in this project are Photographs, sketches and notes.

3.2.1. Case Studies Analysis

Case studies research in Architecture goes beyond the documentation and description of the physical characteristics of the built environment, it is the most prepared mode of assessing a particular phenomenon or group of phenomena which enables the research to see the situation of a particular sample or a similar phenomenon thereby assessing and analyzing it. The case studies selected for this project were sampled purposely to analyze the building sustainability and identify possible improvement of future designs to meet current needs without compromising the needs of the future generation.

Preamble

Case study is an investigation carried out on an existing related structure or project. It gives preliminary knowledge on the project and perfect a means of data collection concept and facts about the project at hand.

The selected case studies were carried out along the following basic findings, which include functional analysis, components facilities, site location, concepts, environmental sustainability, planning criteria.

3.3.1. Case Study One: Shenzhen Bao'an District Maternal and Child Health Hospital, Shenzhen, China.

3.1.2 Description of Building

The building was completed in 2015, it is characterized by a compact triangle structure thoughtfully designed to address the challenges of the dense area. It contains short circulation paths and efficient vertical transportation. The building also incorporates intelligent interfaces like robotics systems and integrated smart technology into the structure. It also supports energy efficiency and environmental integration.

1. Site Planning and Landscaping

The design introduces a number of decentralized landscape systems such as courtyard greening, roof greening and entrance plaza greening into the building. At the same time, the scattered courtyard greening is parallel to the hospital traffic axis, and the retreat greening platform is adopted to maximize the enjoyment of the waiting space on each floor. Sunlight and green

landscapes shorten the distance between patients and nature, enhance the richness of space experience, and form a calm and healing architectural space.

Building Envelop and Material Types

Not satisfied with a fixed functional space, the building implements timely updates of treatment methods and treatment environment according to usage requirements and technical iterations during the operation phase. Due to the introduction of intelligent waiting room technology, a large number of waiting rooms have been transformed into cultural exhibition spaces, communication spaces and children's playgrounds. The transformation of functions not only makes the treatment procedures more efficient, but also brings more entertainment and recreation space for doctors and patients. At the same time, the intelligent interface and efficient traffic space reserved in the architectural design also provide a good platform for the introduction of intelligent technology and robots.

Building and Forms

The building adopts a compact triangle form to optimize space in a constrained site. This design organizes the building around a central medical technology department with the outpatient department positioned along the main urban road for accessibility and the impatient department located further from noisy urban roads to ensure a quieter environment for patients.

The building occupies a total floor area of approximately 99,486 square metres in a compact urban plot balancing high density requirements with functional efficiency.

B. Appraisal of The Building

The project is located in Baoan Center, the core of the Bay Area, surrounded by high-density mixed commercial and residential land. Under the requirements of high-density urban environment and complex functions, how to design efficient medical buildings to meet the tasks carried by the building itself is a major design difficulty. In the compact urban center land, Shenzhen Baoan District Maternity and Child Health Hospital not only provides users with a pleasant experience, but also maintains the vitality and flexibility of building growth in the iterations of demand, providing a sustainable, Green and smart medical buildings.

With the economic development of Bao'an District and the rapid increase in population size, the only maternity and child care hospital in the district has become increasingly overwhelmed. In 2009, the Bao'an District Government decided to plan a new maternity and child care hospital to relieve the medical pressure in the area. Therefore, the newly-built Baoan District Maternity and Child Health Care Hospital has been assigned to undertake the medical needs and maternal and child health care of the 5.8 million people in its jurisdiction.

CAPOL undertook the general contracting work of architectural design from the plan to the construction drawings, creatively adopting the "compact triangle structure": with the medical technology department as the core, the outpatient department was arranged on the main urban road with more people, and the inpatient department. It is far away from urban main roads and noise sources. The shortest medical consultation, first aid flow line and hierarchical registration system formed by the triangular layout create an efficient medical experience.

2. Merits

- Efficient spatial organization and functionality through 'compact triangle structure'.
- Integration of green and healing spaces.
- Adaptive and flexible design.
- User-centric and inclusive design.
- Sustainability and smart design.
- Recognition and community impact.

Demerits

- Challenges of high density complex.
- Complexity of functional integration.
- Potential over reliance on technology.
- Scalability constraints.



Figure 1 Shenzhen Bao'an Hospital. Source: Archdaily.com



Figure 2 Shenzhen Bao'an Hospital Ground floor plan. Source: Archdaily.com

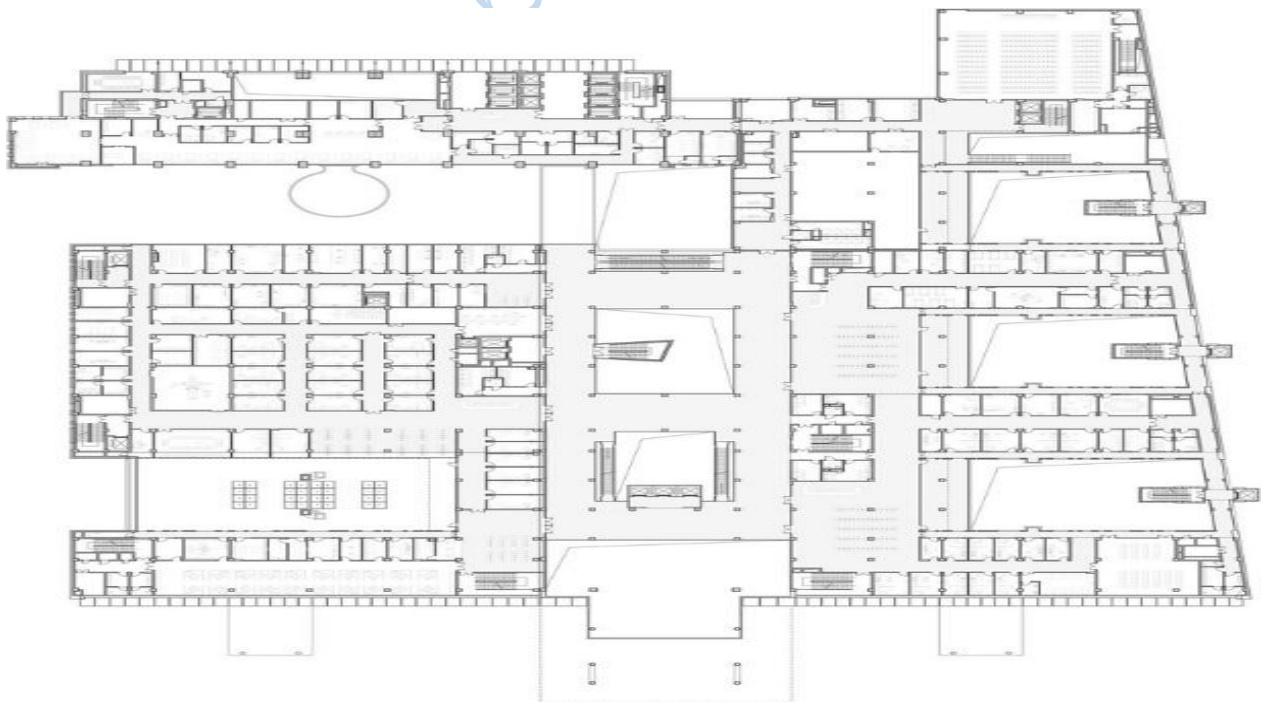


Figure 3 Shenzhen Bao'an Hospital First floor plan. Source: Archdaily.com

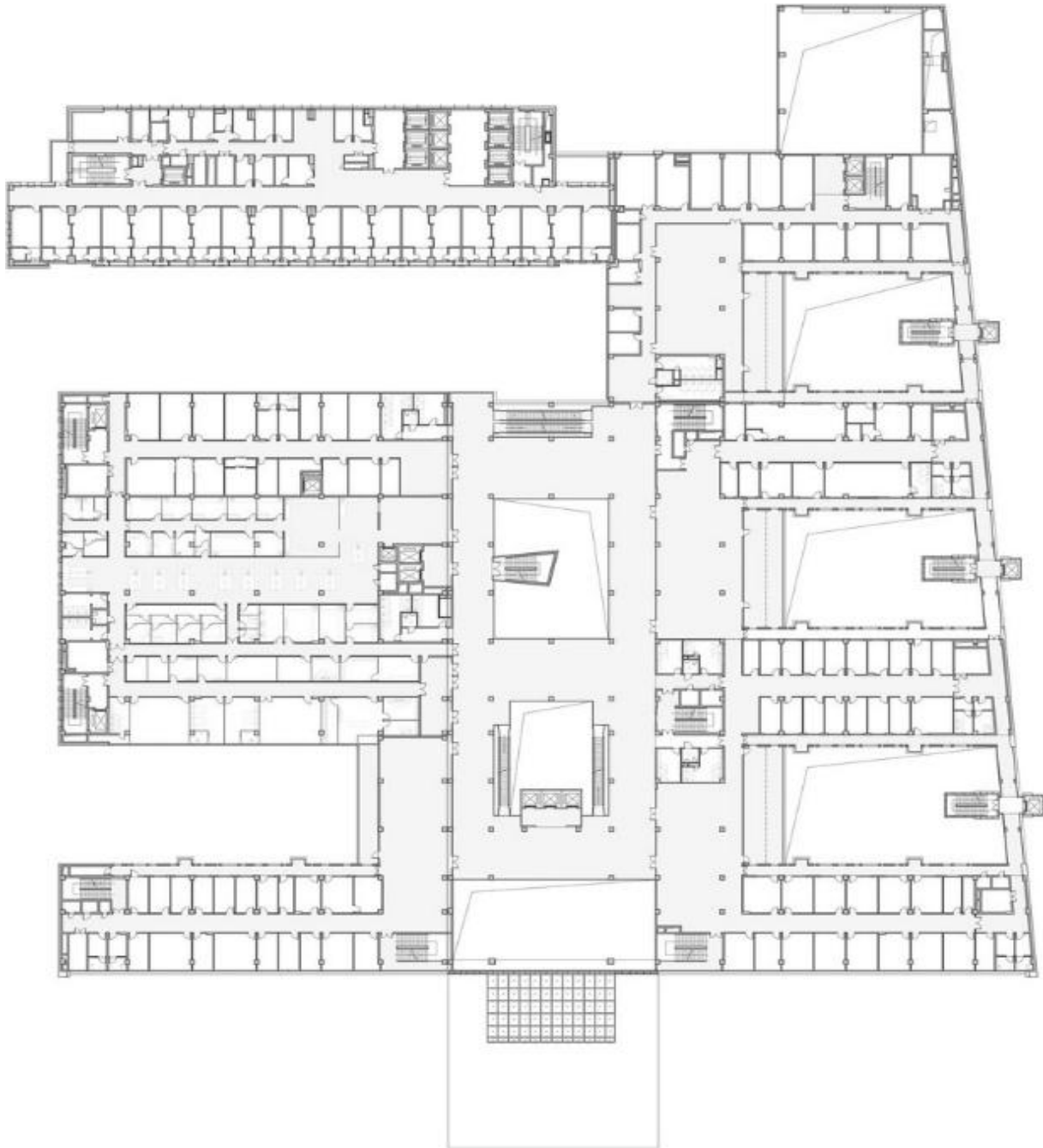


Figure 4 Shenzhen Bao'an Hospital floor plan. Source: Archdaily.com



Figure 5 Shenzhen Bao'an Hospital view. Source: Archdaily.com



Figure 6 Shenzhen Bao'an Hospital roof. Source: Archdaily.com



Figure 7 Shenzhen Bao'an Hospital elevation. Source: Archdaily.com

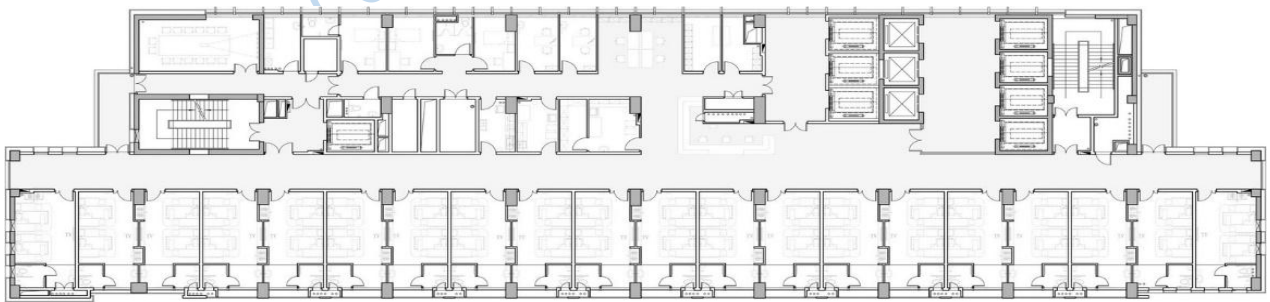


Figure 8 Shenzhen Bao'an Hospital plan. Source: Archdaily.com

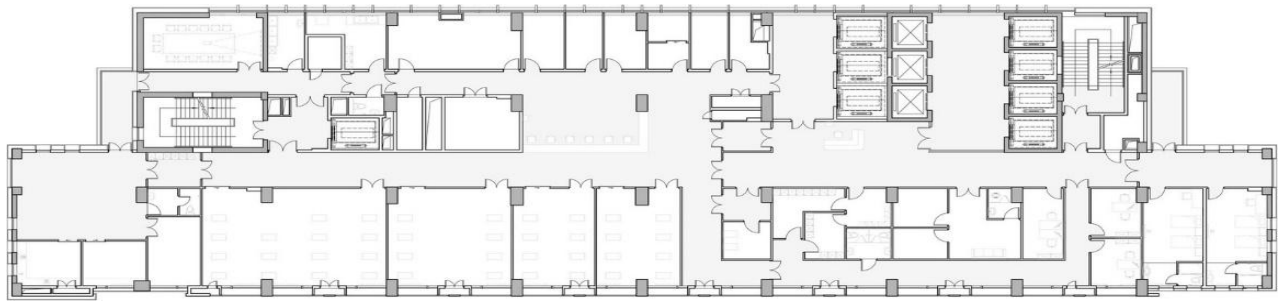


Figure 9 Shenzhen Bao'an Hospital upper floor. Source: Archdaily.com



Figure 10 Shenzhen Bao'an Hospital courtyard. Source: Archdaily.com

Figure 11 Shenzhen Bao'an Hospital interior. Source: Archdaily.com



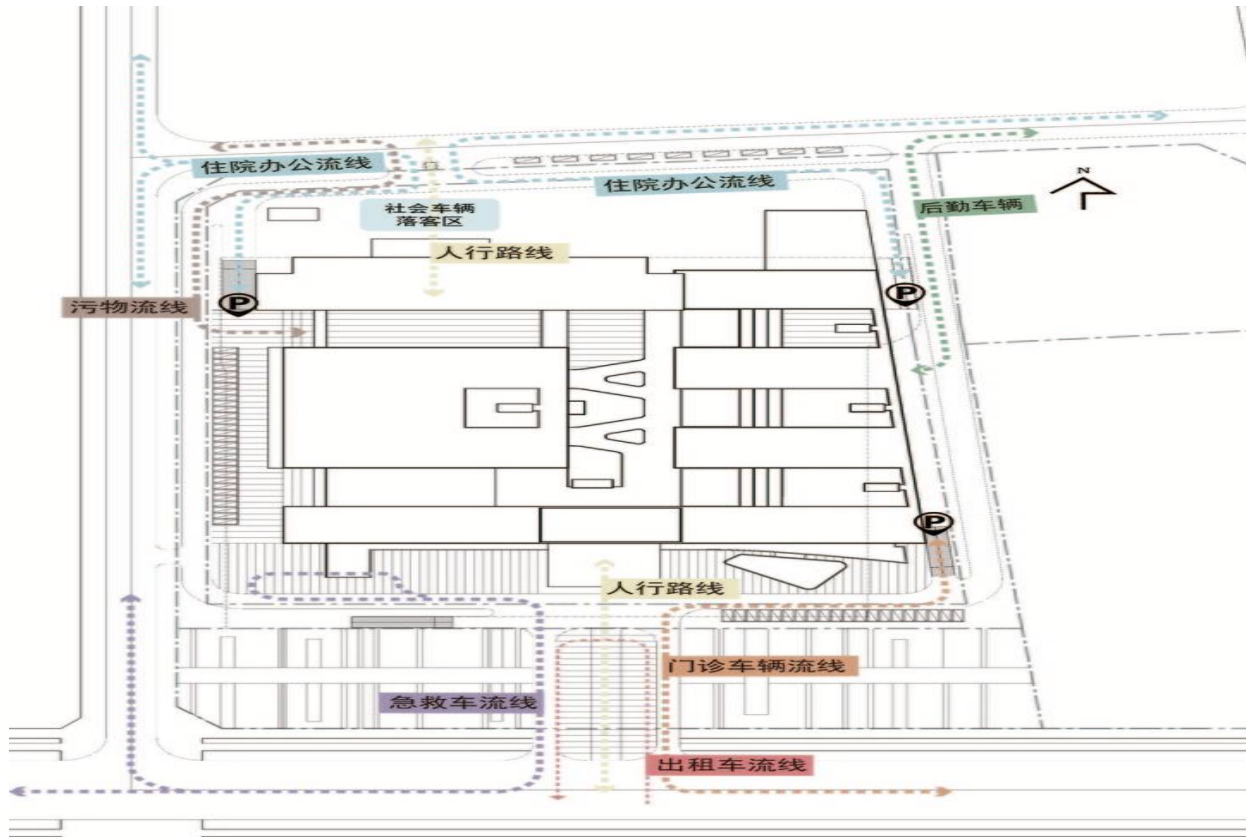


Figure 12 Shenzhen Bao'an Hospital site. Source: Archdaily.com

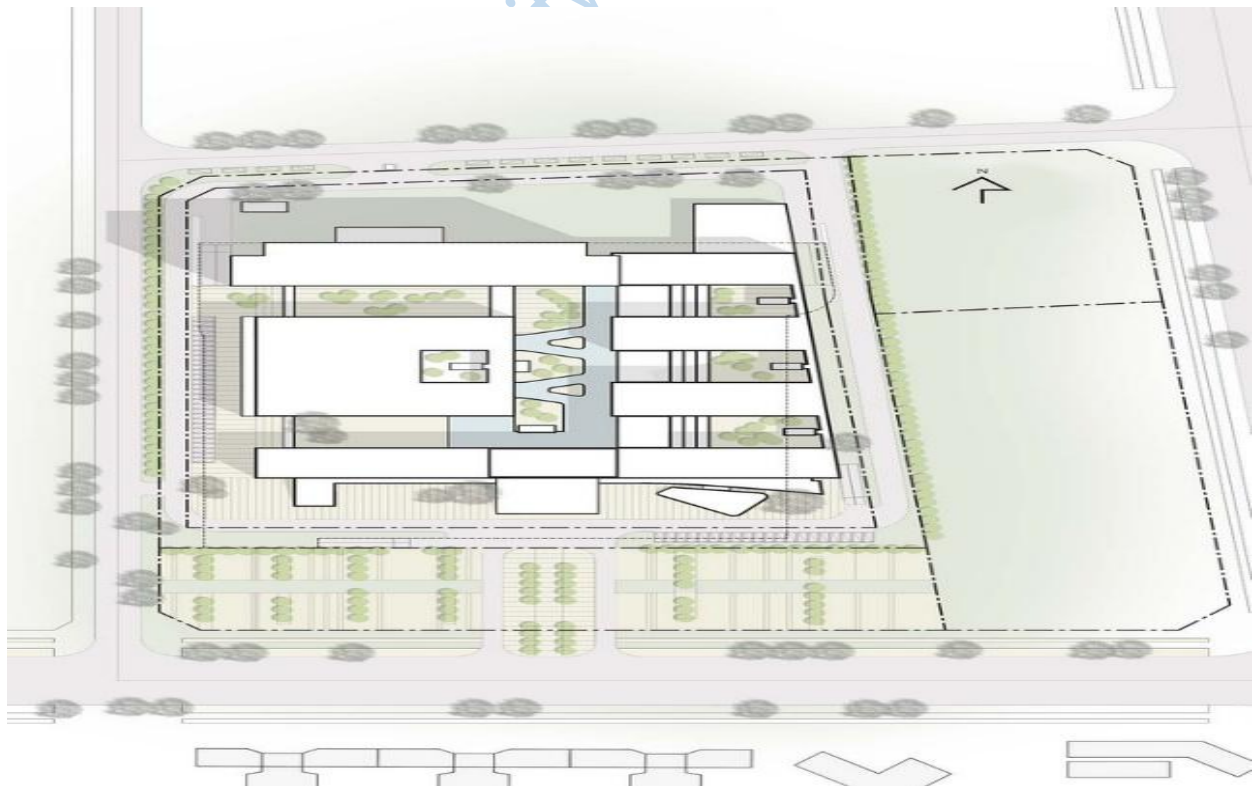


Figure 13 Shenzhen Bao'an Hospital site zoning. Source: Archdaily.com

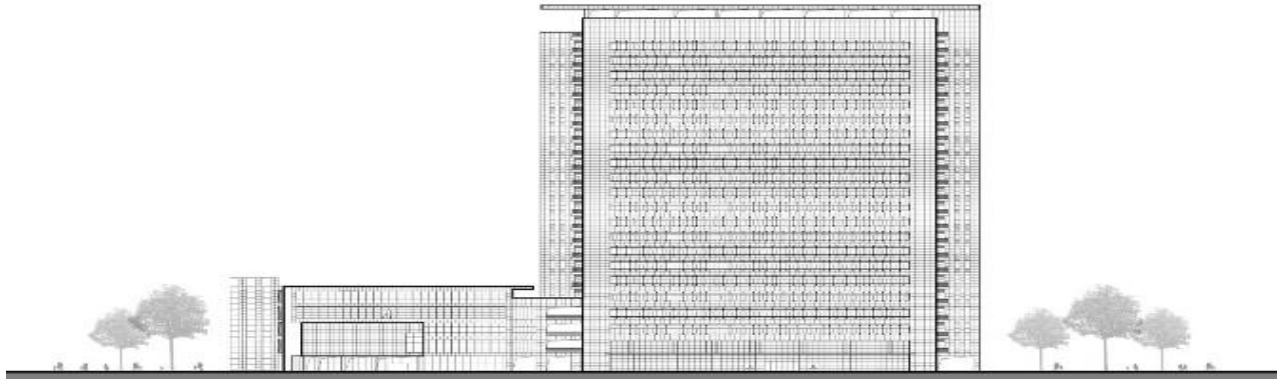


Figure 14 Shenzhen Bao'an Hospital elevation I. Source: Archdaily.com

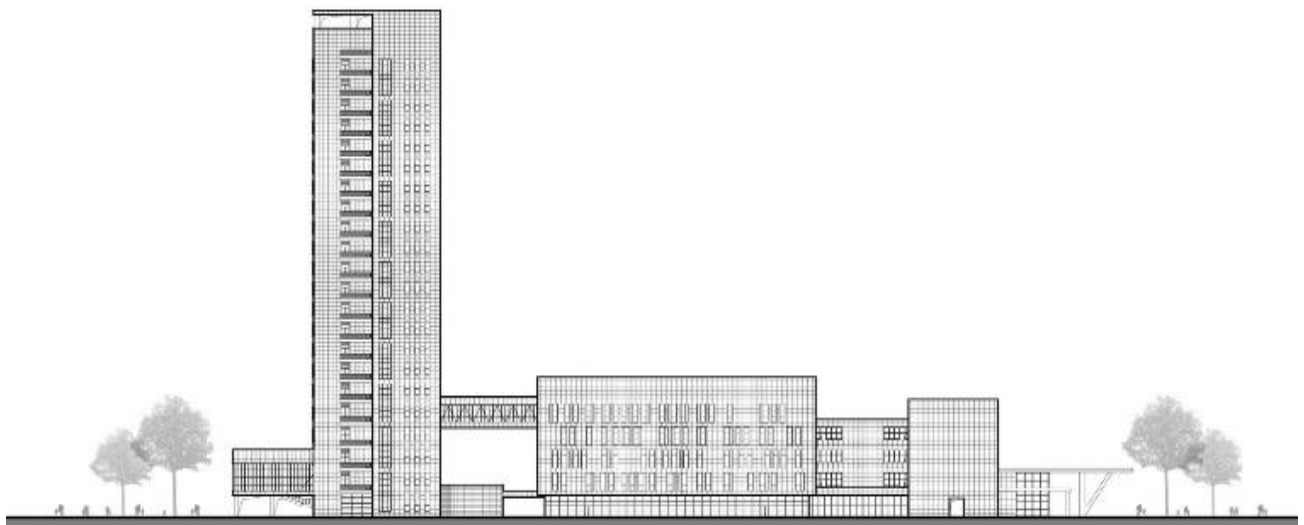


Figure 15 Shenzhen Bao'an Hospital elevation II. Source: Archdaily.com

Case Study Two: Terra Alta Oberkirch Maternity Hospital

A. Description of Building

The hospital is strategically located in Oberkirch, a town in Switzerland characterized by a mix of residential and natural landscapes. The site planning reflects a deliberate intent to integrate the building with its surroundings while prioritizing user comfort and accessibility.

1. Site Planning and Landscaping

The site planning reflects a deliberate intent to integrate the building with its surroundings while prioritizing user comfort and accessibility. It is positioned to harmonize the semi-rural setting avoiding the imposing scale of typical medical facilities. The site is organized to segregate public and private zones. The main entrance is accessible from the street welcoming visitors and patients while service areas are discreetly located to minimize disruptions. The patient area including birthing rooms are oriented to maximize privacy and views of surrounding greenery.

The layout ensures minimal walking distance for staff with a central nurses station positioned to oversee patient area. This aligns with hospital design principles that emphasize operational efficiency as noted in Kaarwan's Architectural Guide. The site plan also incorporates outdoor spaces such as landscape gardens and pathways that encourage visitors to engage with nature supporting the healing concept. These spaces are accessible from patient rooms enhancing the therapeutic environment.

The surrounding gardens and green spaces are designed to create a calming atmosphere drawing on principles of biophilic design. The landscape flows seamlessly around the building with planted areas that reflect the local flora of Oberkirch. There are pathways and seating areas that allow patients, families and staff to use outdoor spaces for relaxation and contemplation. Its landscape incorporates sustainable elements such as rainwater harvesting and native planting to minimize environmental impact.

Building Envelop and Material Types

The façade features a combination of soft, curved forms and large windows which soften the buildings appearance and evokes a residential aesthetic. Large windows places strategically maximize daylight penetration and reduces reliance on artificial lighting. The façade incorporates shading devices such as overhangs or recessed windows to manage solar glare particularly on south facing elevations.

Timber is used extensively in both structural and finishing elements creating a warm and natural atmosphere. Timber cladding is used to avoid clinical feel of the facility and rooms.

Large glass windows and curtain walling systems are employed to maximize light and views. The glass is high performance with low emissivity coatings to enhance thermal efficiency.

Inside, soft materials like wood, natural fabrics and warm color palettes are used to create a home like environment.

Building and Forms

The hospital features soft curved lines in its plan and elevations. The curves create a fluid non institutional appearance distinguishing the building from rectilinear forms of typical hospitals.

The interior is organized around a central circulation spine with patients rooms and birthing suites arranged to ensure privacy and access to natural light. The design incorporates open adaptable spaces that can be reconfigured as needed. The roof is a gently sloped possibly with green elements to enhance sustainability.

B. Appraisal of The Building

2. Merits

- Residential aesthetics and emotional comfort
- Efficient and functional design
- Sustainable and biophilic design
- Contextual sensitivity
- Flexibility and future proofing

Demerit

- Limited scalability
- Potential overemphasis on aesthetics
- Environmental challenges

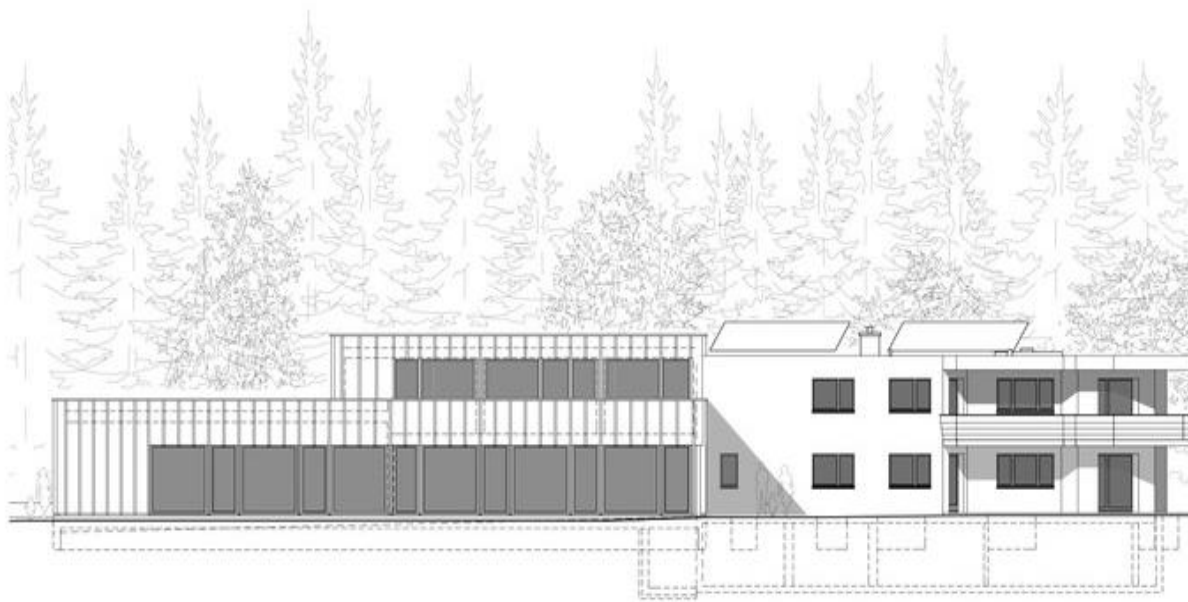


Figure 16 Terra Alta Oberkirch Maternity Hospital ELEVATION. Source: Archdaily.com

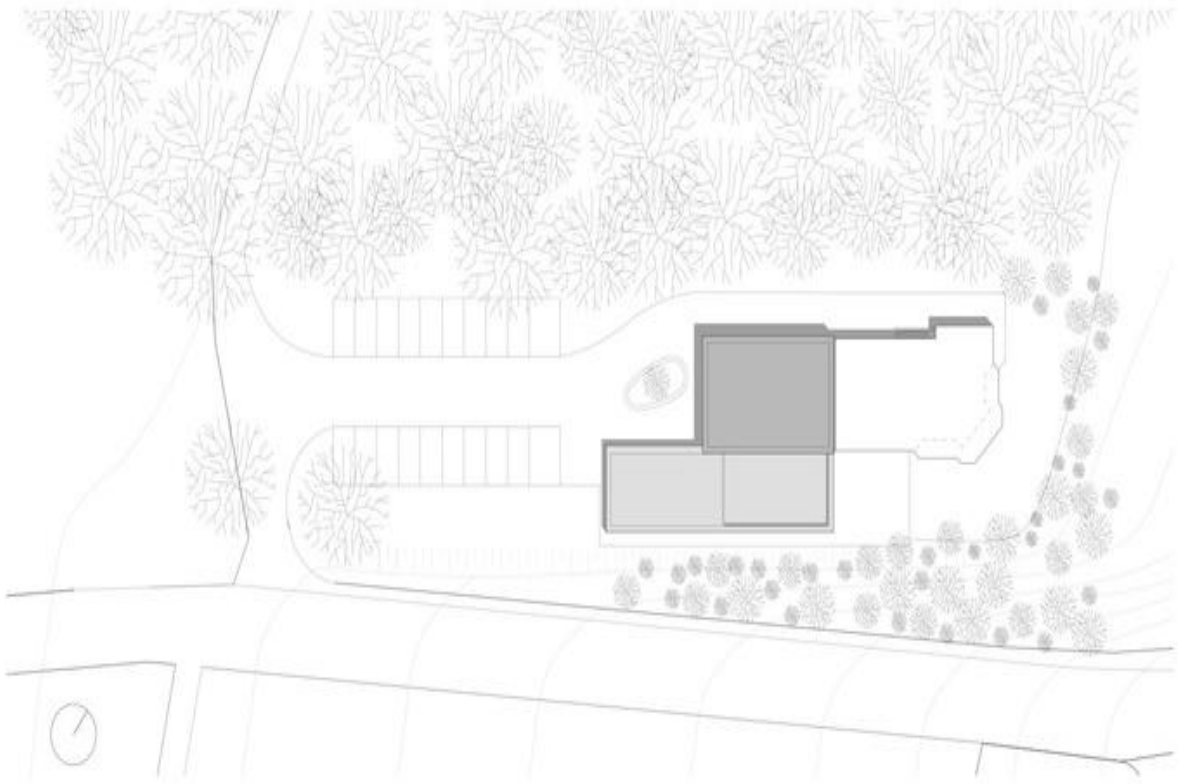


Figure 17. Terra Alta Oberkirch Maternity Hospital site. Source: Archdaily.com

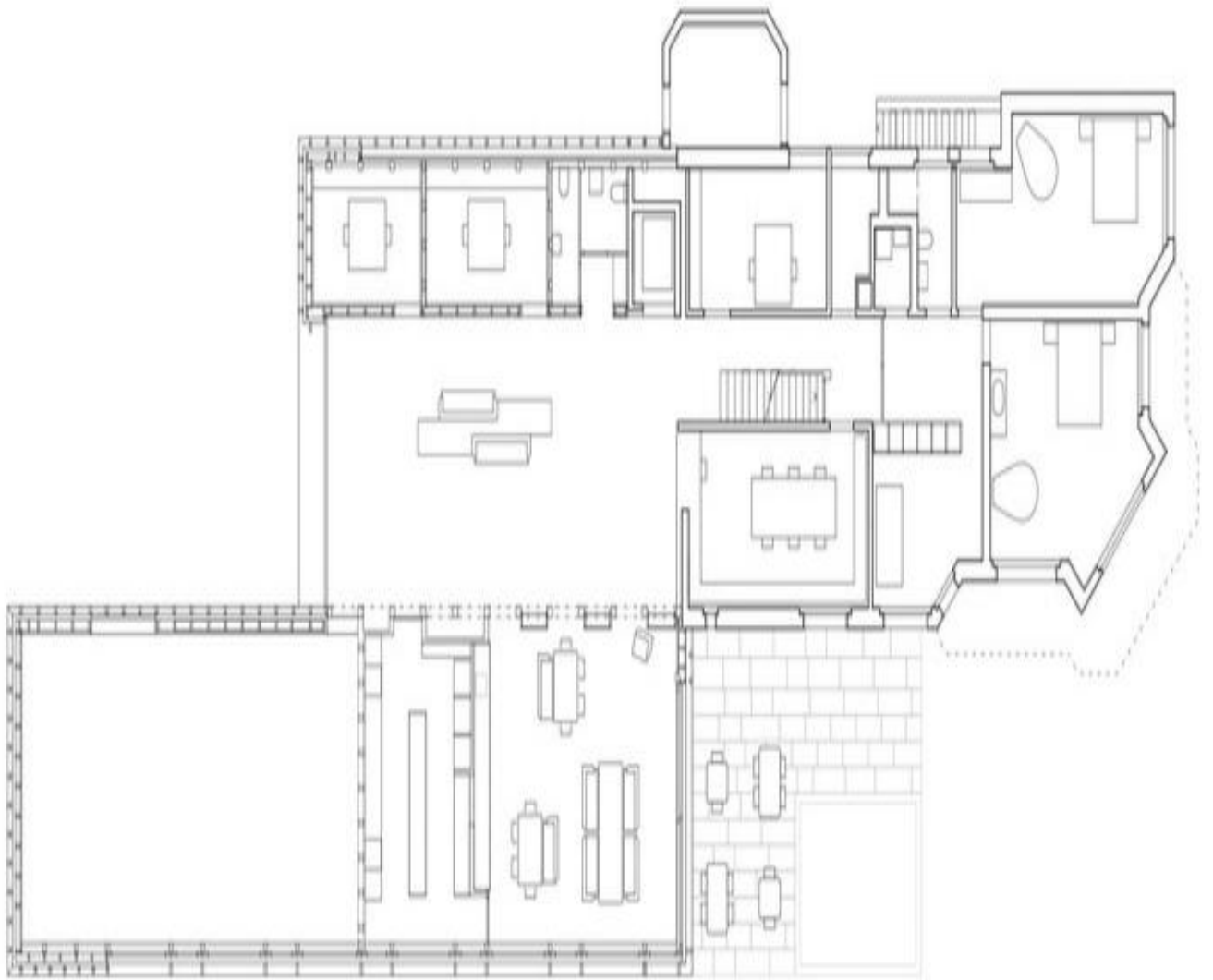


Figure 18. Terra Alta Oberkirch Maternity Hospital floor plan. Source: Archdaily.com



Figure 19. Terra Alta Oberkirch Maternity Hospital floor plan I. Source: Archdaily.com



Figure 20. Terra Alta Oberkirch Maternity Hospital facade. Source: Archdaily.com



Figure 21. Terra Alta Oberkirch Maternity Hospital perspective. Source: Archdaily.com



Figure 22. Terra Alta Oberkirch Maternity Hospital ELEVATION ii. Source: Archdaily.com

3.3.1. Case Study Three: Mother and Child Specialist Hospital, Owa Alero, Delta State.

A. Description of Building

The building is a modern healthcare facility organized to segregate clinical diagnostic and administrative zones to optimize workflow. Maternal wards, pediatric units, operating theatres, diagnostic imaging suites and outpatient clinics arranged to minimize cross-contamination and enhance patient flow. The design incorporates single-patient rooms, small wards to reduce infection risks and provide privacy. It incorporates flexible spaces to accommodate future expansion and changes in medical technology.

Site Planning and Landscaping

The site is strategically located in Owa Alero for its proximity to major population centers in Delta to serve the entire area. The site is accessible via major roads ensuring easy access. It is also considered low noise and has no environmental pollution .

The site has a relatively flat topography with ample parking and clear wayfinding cues. It contains gardens, child-friendly outdoor spaces and public recreational spaces to enhance well-being of patients.

Building Envelop and Material Types

The building contains insulated walls, large windows with shading devices and prioritizes natural light usage by incorporating high performance glazing therefore balancing daylight with energy efficiency. The usage of reinforced concrete is evident along with other sustainable materials to enhance performance and building lifespan.

Building and Forms

The building is a low rise, horizontally spread structure three stories tall reducing overreliance on elevators.

Merits

- Specialized care delivery
- Healing environment features
- Flexibility

- Community impact

Demerits

- Resource constraints
- Infrastructure limitations
- Maintenance challenges
- Accessibility barriers



Figure 23. Owa Alero,hospital. Source: google



Figure 24. Owa Alero,hospital interior. Source: google



Figure 25. Owa Alero,hospital facilities. Source: google



Figure 26. Owa Alero, hospital ward room. Source: google

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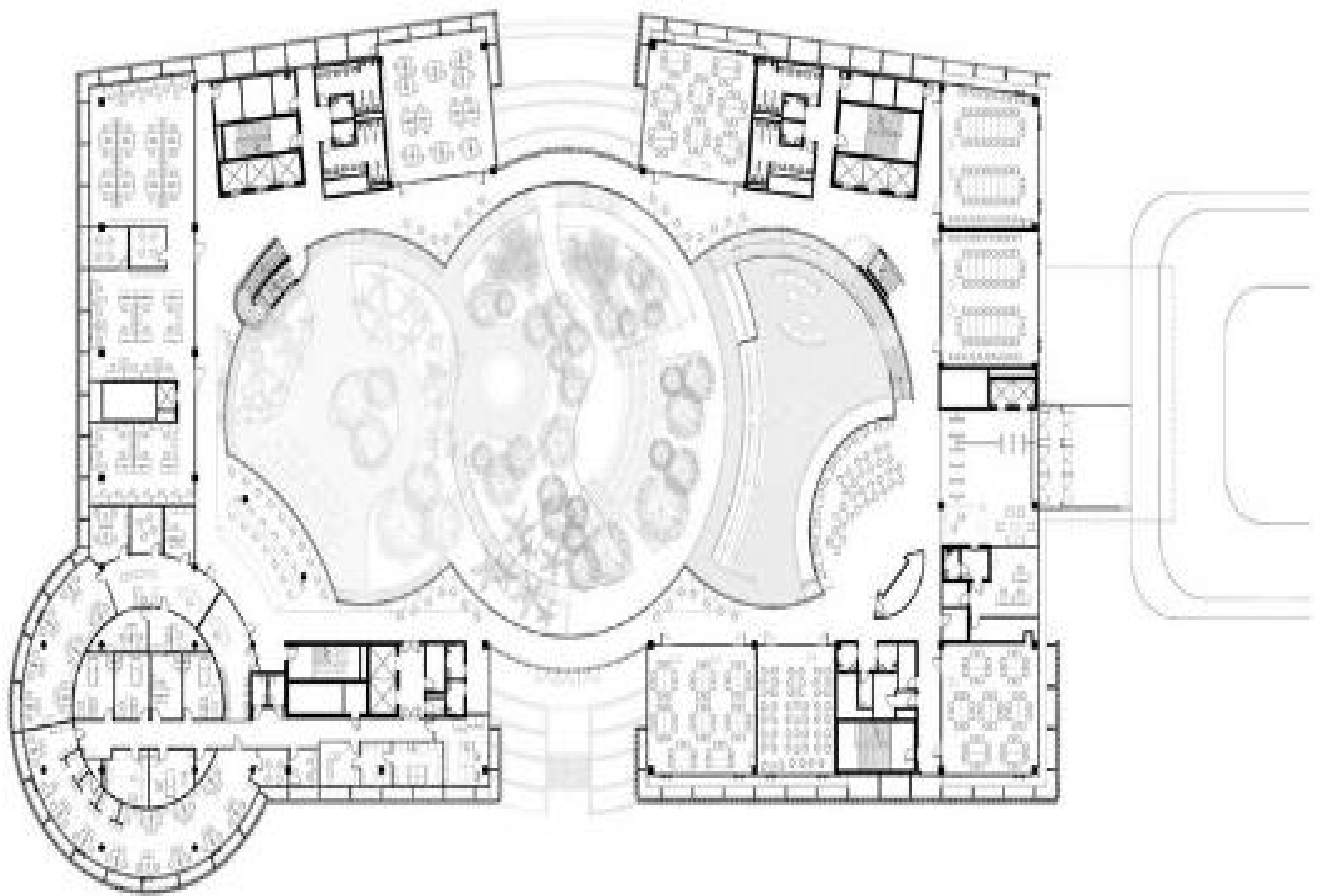


Figure 27. Owa Alero,hospital floor plan. Source: google

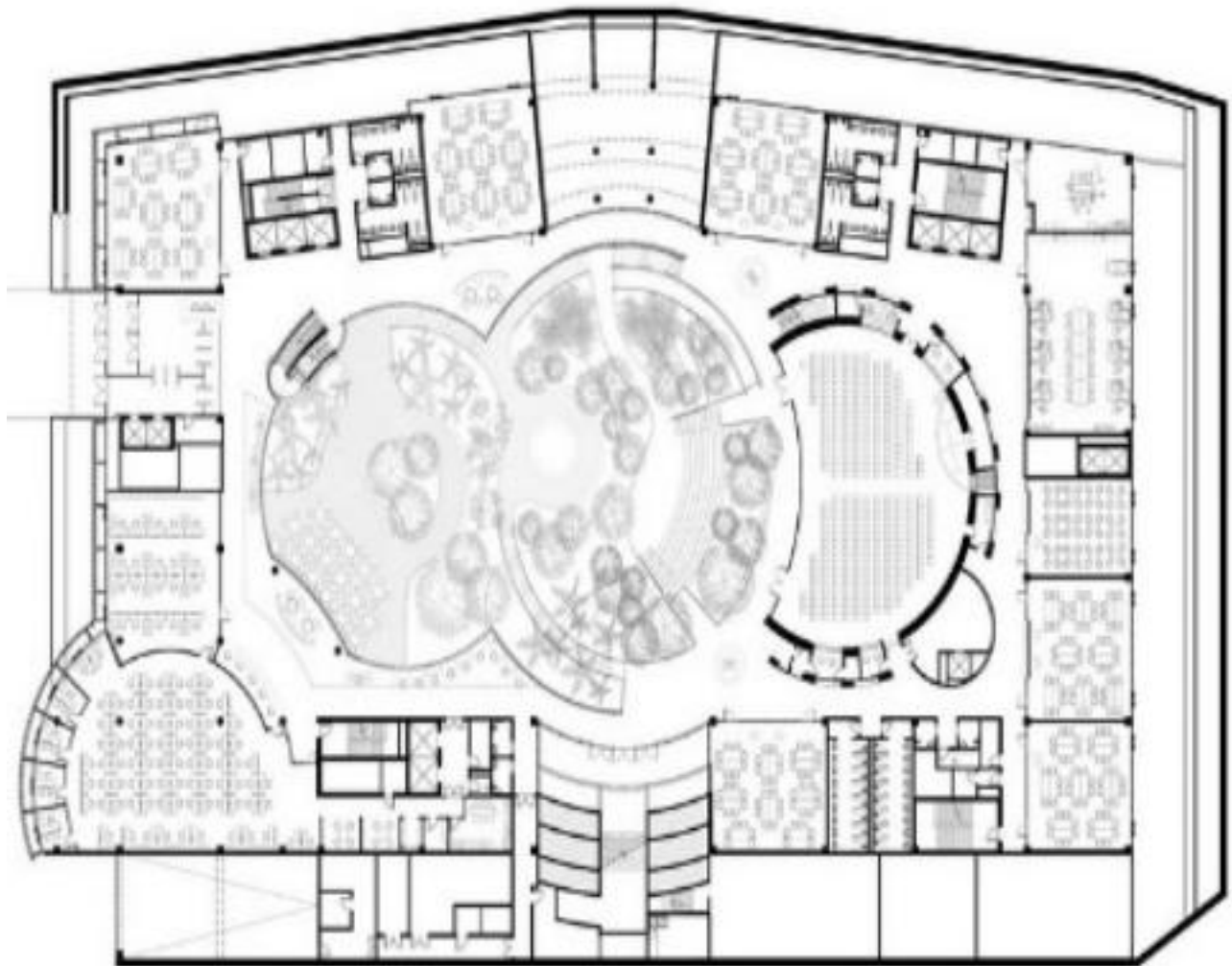


Figure 28. Owa Alero,hospital floor plan II. Source: google

Deductions

Spaces common to all the case studies include;

- Waiting area
- Nurses station
- Delivery rooms
- Theatre
- Ward rooms
- Theatre complex
- Consultation room.
- Record rooms
- Ultra sound rooms
- Laboratories

The sustainable strategies in the case studies and biophilic approaches will be employed in this design.

Green areas and potted plants will be placed around circulation and lobbies to create a feel of connection to nature while they help absorb toxic air and CO₂ present in the environment. These will help create a cool natural feel within the hospital.

Natural lighting will be allowed into circulation spaces in this design. Atriums and curtain walls will be used to achieve this, wide and properly defined circulation that connect spaces within the hospital is also required.

Consideration will be made for the physically challenged too. Also, Signages should be strategically placed around the building to indicate what spaces are where.

Circulation on site is of utmost importance, for patients, doctors and other services. It will flow seamlessly with the entrances and exit that leads into or goes out of the building.

Pedestrian walkways should be such that they don't cross vehicular path to avoid accidents. Spaces like children outdoor area on the site should be should be shielded from vehicular path too. Green areas should be sufficiently designed around all these spaces.

Materials seen in the case studies that will be used in this design include;

- Curtain walls;

To allow sufficient natural lighting into the space.

- Steel; Steel is one of the most commonly used materials as reinforcement for construction due to its high strength, durability and relatively low cost. Steel has an almost endless life cycle to its ease of recover and 100% practical recyclability without any substantial loss of quality other materials gotten from research to be adopted include;

- Hydraform bricks

- Photochromic glass windows to respond to incident solar gain by adjusting to allow only the required amount into the building.

- The paint finish (Airlite paint) material will be used in the interior to neutralize pollutants, disallow the growth of mold and microbes, and ensure the absence of germs.

Chapter Four

4.1. Study Area

Located in West Africa, the Federal Republic of Nigeria comprises 36 States and the Federal Capital Territory of Abuja. According to the latest projections, Nigeria has a population of approximately 169 million (UN, 2012), of which 29 million are children under the age of five. It is estimated that every year more than 7 million babies are born in Nigeria (MNCHW, 2016).

Abuja is centrally located and serves as the administrative seat of the Federal Republic of Nigeria. Covering an area of about 8,000 square kilometers (FCC 250Sq Km), it is bordered by Kaduna, Niger, Nasarawa and Kogi states with a projected population figure of 3,419,323 million. Children under 5 years make up 21% while Women of childbearing age constitute 25% of the total population. The total number of Health facilities in the FCT is about 906, and they are classified into Public and Private Health Facilities. The Public Health Facilities are about 241 in numbers, while Private health facilities are about 665, which represent 26.6% and 73.4% of the total number of facilities respectively. It is observed that Private health facilities are predominant in 3 of the Area councils with the highest number of the facilities in AMAC, followed by Bwari and Gwagwalada. While the converse, is true for Kuje, Abaji and Kwali area councils. The public facilities are made up of 222 Primary health centers, 15 general hospitals and 4 tertiary hospitals representing 92.1%, 6.2% and 1.7% of the total number of public healthcare facilities within the FCT respectively, while the private health facilities are made up of hospitals, clinics, maternity clinics, eye clinics, dental clinics, physiotherapy clinics, diagnostic centers and laboratories (FCT Health and Human Services Secretariat, 2014, 2017).

Urbanization is a global phenomenon that has transformed and continues to alter landscapes and the ways in which societies function and develop (Griffith, 2009). Cities offer the lure of better employment, education, health care, and culture; and they contribute disproportionately to national economies. Cities offer the lure of better employment, education, health care, and culture; and they contribute disproportionately to national economies (Trivedi, Sareen, and Dhyani, 2008).

Abuja has a short history, as it was a planned city that was developed primarily during the 1980s. Abuja is one of the fastest growing cities in the world, with a population that already is climbing to 2.5 million since its development in the 1980s. During the early 2000s, the city's population

grew by almost 140%. Today, most areas of the city still see annual growth of 35%, making it one of the fastest-growing cities in the world. Because of the city's reputation for being welcoming to all groups, no matter their ethnicity or religion, the population is only expected to continue to grow for Nigeria's capital city.

The last census taken in 2006 put the population at 776,298. However, between 2000 and 2010, the population grew by almost 140%, with more recent estimates showing that the population now exceeds 2.4 million. Abuja Municipal Area Council is one of the only planned cities in Africa, and judging by its massive population growth, it is one of the most successful. The city is home to multiple religious sites and centers, including the Nigerian National Mosque. Abuja is one of the wealthiest cities in Africa. The city was planned in order to bring together all of the various tribes, religions and ethnic groups found throughout Nigeria. ²⁴ The city was planned to be a safe city, unlike many other Nigerian cities that experience high rates of violence. The city's population is extremely diverse, and groups that reside here include Afo, Gwari, Hausa, Koro and Bassa, just to name a few. The official language of the city is English, although other languages are spoken, including Ibo, Fulani and Yoruba. Approximately half of the city's residents are Muslim, 40% are Christian, and the remainder has follow other religions. Population Explosion is considered synonymous with uncontrolled inflows of people into the City centre, unplanned, incremental urban development, characterized by a low density mix of land uses on the urban fringe. Abuja Municipal Area Council has experience urban sprawl in recent time. Urban sprawl is defined as the physical pattern of low-density expansion of large urban areas mainly into the surrounding agricultural areas (European Environment Agency, 2006). Sprawl is commonly used to describe physically expanding urban areas. Such a modified landscape reveals a situation where cities are spreading, thereby minimizing the time and distances between and inand-out of the cities. Africa is witnessing the fastest rate of urbanization at about 67% when compared with other developed and developing continents (Cohen, 2004). In Abuja Municipal Area Council, the growth and complexity of human settlements and in particular the process of urbanization and urban sprawl have been phenomenal. Federal Capital Territory has dual settlement types of rural and urban, with majority dwelling in the rural areas. Jat et al. (2008) observes that the process of urbanization or its growth drives sprawl pattern, which most often also have adverse impacts on ecology of the area, especially hydro geomorphology and vegetation. Furthermore, Heimlich and Anderson (2001) believe that while

urban centers are growing in population and sprawl (extent), the peri-urban areas are undergoing rapid transformation: with land coming under increasingly intense pressure through construction to provide space for an array of urban land uses. Thus, with rapid population increase and a finite urban land area therefore, available land per individual shrinks pitilessly. The result is an urgent need for proper geo-management of land and the concomitant availability of a detailed, accurate and up-to-date geo-information (Lemmens, 2002). Most importantly, the sprawling nature of cities is critically potent in providing explanations for the major impacts that are evident in increased energy, land and soil consumption. This is because these impacts threaten both the natural and rural environments, raising greenhouse gas emissions that cause climate change and elevated air and noise pollution levels which often exceed the agreed human safety limits. Thus, urban sprawl produces many adverse impacts that have direct effects on the quality of life of people living in cities (European Environment Agency, 2006).

The existing roads some Abuja Municipal Area Council. Communities are unbarred; the roads are very bad most especially during raining season. The existing health center comprises the maternity and dispensary sectors. There is usually lack of drugs and the facilities are in no way adequate. Migration is not only determined by economic factor but also socio-cultural and psycho-social factors. Due to lack of all these amenities to the rural people, they tend to put out to urban centers where such amenities are already provided at less cost (Ramatu, 2018).

4.1.1. Site Location

The site is located at Lugbe area, Abuja.

4.1.2. Site Selection Criteria

Site selection criteria have been the standard of judgment in choosing a particular site for the proposed project; there are criteria and number of factors considered which include the following;

- The need for the facility in the particular area.
- Zoning in respect to master plan
- Accessibility to the proposed site
- Availability of land that can accommodate the proposed project and the external works
- The prevailing climate condition of the area

- The nature and condition of soil that should be able to support and carry both dead and live loads that will be imposed by the proposed project.

4.2. Project Analysis and Design Synthesis

4.2.1. Brief Analysis

The brief is to produce a design of a Mother and Child Hospital and it should be a functional, sustainable and purposed building which promotes health, safety, social integration, learning and recreation in line with international best practice standard so as to meet the goal of excellency in healthcare and maternal and child care in Abuja. The project is expected to meet the needs of mothers and their children as well as the staff and also add to the aesthetics of the environment.

The design brief is one of the important elements that form part of the overall process in creating a healthcare project. It is essential that the brief is developed in the context of the total lifespan of the project. The brief will:

- Describe clinical service needs and design vision/objectives;
- Define environmental quality and sustainability objectives, whole hospital policies and departmental policies; and
- Detail technical requirements and schedules of accommodation.

4.2.2 Brief Development

A hospital is not just an architectural envelope which accommodates clinical functions and facilities; rather it is a synthesis of sophisticated interconnected systems which work together to meet the functional requirements of the different activities carried out within a hospital setting.

The aim of the project is to design a facility to cater to the growing needs of maternal and child care as the study elaborates while providing the best healing environments and design procedures.

4.2.3. Design Criteria

Social and cultural aspects of sustainability are the preservation of health and comfort as well as the values which is the main goal of preservation projects. As ecologic sustainability includes the economic use of resources, preference of renewable energy sources and preservation of ecosystems, selection of location, water conservation, energy and atmosphere, transportation, natural lighting, natural air conditioning and the criteria of distance between buildings are discussed under this heading.

4.2.4. Conceptual Development

The development of a strong, simple organizational concepts aids the relationship of the external layout to the clinical departmental adjacencies and the internal way finding strategy.

The building gets its concept from inclusive approach, open design and the concept of biophilia. The building has an open design to allow residents feel closer to nature. The building follows the idea of form follows function providing spaces that aid the healing process.

4.2.5. Functional Relationship

Functional relationship describes functional interactions between spaces in the building design. It gives good flow of movement in the design as it totally overcomes the difficulties of crisis cross movement and isolation of spaces; these are zoning, bubble diagram and flow chart.

-Bubble Diagram

These shows how one space works with other or indicate of functional pattern within the space.

- Flow Chart

This is a design diagram showing the flow of movement and the link between rooms and spaces.

4.2.6. Space Allocation/ Schedule of Accommodation

Healthcare facilities should provide a therapeutic environment in which the overall design of the building contributes to the process of healing and reduces the risk of health care-associated infections rather than simply being a place where treatment takes place.

Healthcare buildings exist primarily for the patients and other people who use them. As mentioned, there is a growing body of evidence that if the design is right, satisfaction levels improve as do patients' health outcomes and staff productivity.

When starting to design appropriate healthcare spaces, rather than begin with the functions of rooms, research by the University of Sheffield found that it was more beneficial to concentrate on the needs and activities of all users – patients, staff and others. Examples of activities that occur in healthcare premises include:

- Arriving;
- Moving around the building;

- Waiting;
- Resting in in-patient facilities;
- Consultation, diagnosis, undergoing tests, examination and treatment;
- Socializing and meeting;
- Shopping;
- Bathing, showering, washing, toilet and grooming;
- Counselling/sanctuary.

4.2.7. Construction Methods and Materials

Construction method

Structural frame work method to be used, concrete slabs and columns cast-in-situ. The main structural framework to be built with flat reinforced concrete slabs.

Construction materials;

-Hollow block

-Reinforced concrete

-Glass

-Aluminum roofing sheet

-Wooden roof carcass

-Wooden frames and doors

-Metal doors

-Curtain wall

4.2.8. Building Services

Electricity line, road, telecommunication water supply is available on the site and existing school buildings on the premises. This makes the work easier and faster.

Chapter Five

5.1. Project Appraisal

The project is wholly feasible i.e. it is practical and sustainable. The project can be successfully carried out and completed within the discussed constraints, limitations, circumstances and resources.

The study investigated sustainable design approaches and materials that can be used in designing and achieving a mother and child hospital in Nigeria which can be said to be environmentally friendly in all its sense. Four case studies were investigated in the course of this thesis.

Green areas and potted plants will be placed around circulation and lobbies to create a feel of connection to nature while they help absorb toxic air and CO₂ present in the environment. These will help create a cool natural feel within the hospital.

Natural lighting will be allowed into circulation spaces in this design. Atriums and curtain walls will be used to achieve this, wide and properly defined circulation that connect spaces within the hospital is also required.

Consideration will be made for the physically challenged too. Also, Signages should be strategically placed around the building to indicate what spaces are where.

Circulation on site is of utmost importance, for patients, doctors and other services. It will flow seamlessly with the entrances and exit that leads into or goes out of the building.

Pedestrian walkways should be such that they don't cross vehicular path to avoid accidents. Spaces like children outdoor area on the site should be should be shielded from vehicular path too. Green areas should be sufficiently designed around all these spaces.

Materials seen in the case studies that will be used in this design include;

- Curtain walls;

To allow sufficient natural lighting into the space.

- Steel; Steel is one of the most commonly used materials as reinforcement for construction due to its high strength, durability and relatively low cost. Steel has an almost endless life cycle to its ease of recover and 100% practical recyclability without any substantial loss of quality other materials gotten from research to be adopted include;
- Hydraform bricks
- Photochromic glass windows to respond to incident solar gain by adjusting to allow only the required amount into the building.
- The paint finish (Airlite paint) material will be used in the interior to neutralize pollutants, disallow the growth of mold and microbes, and ensure the absence of germs.

5.2. Conclusion

The aim of this research is to provide a facility that will enhance health, safety and all activities surrounding maternal care, working in-line with international standard so as to meet the goal of excellency being pursued and to meet the needs of mothers and their children in Abuja. This study is expected to investigate indoor and outdoor healthcare qualities and document the presence or absence of sustainable design elements in maternity hospital design and to adopt sustainability building criteria, principles and their implementation in healthcare building designs which will reduce energy consumption and sustain building over a long period of time in addition to providing a comfortable place for users.

5.3. Recommendations

Features of sustainable building are connected with four major objectives in social, economic, technical, technological, environmental groups and these four objectives include enhancing the finance and economic savings, reducing the impact on environment and increasing the compatibility with environment, increasing the social efficiency and usefulness, enhancing the quality, and optimizing the building. This model generally indicates and proposes features which building should have in order to achieve sustainability.

The study presents a good set of comfort variables for future designs, based on simple relations between the form, orientation, and location of functions and openings. A proper choice of site is also important, as size and form can inhibit recommended initial design decisions of the building.

Finally, application of the sustainability principles herein presented could be reflected in other building typologies, for example, housing developments and hospitals for improving the design process as a whole.

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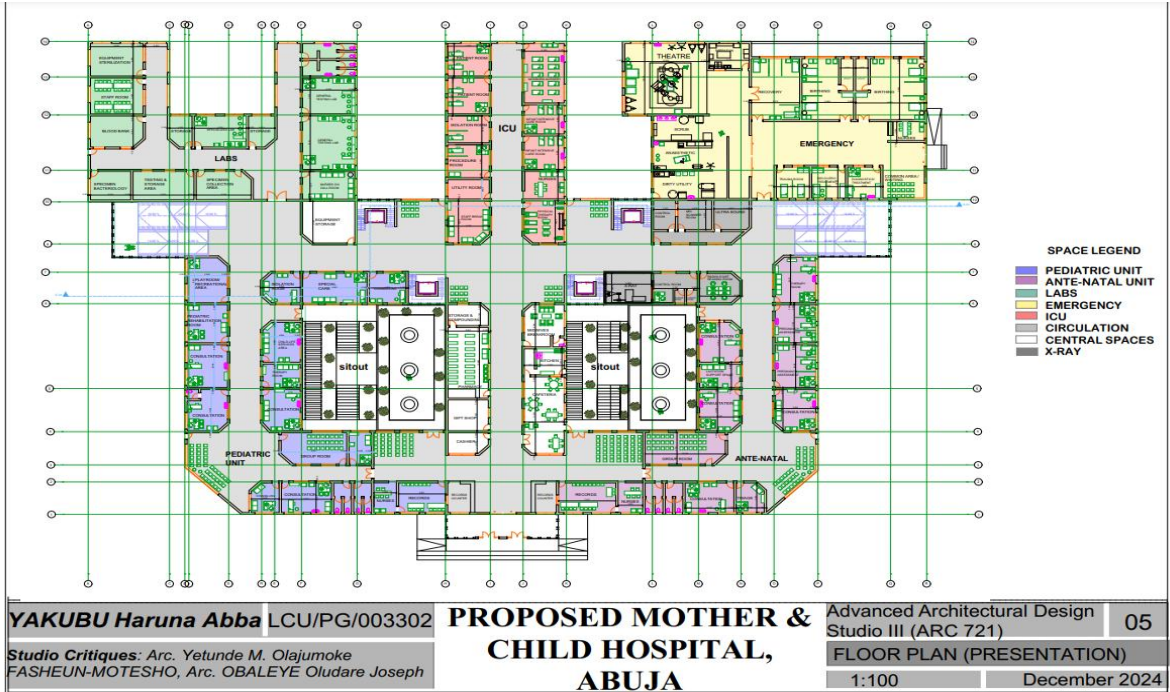
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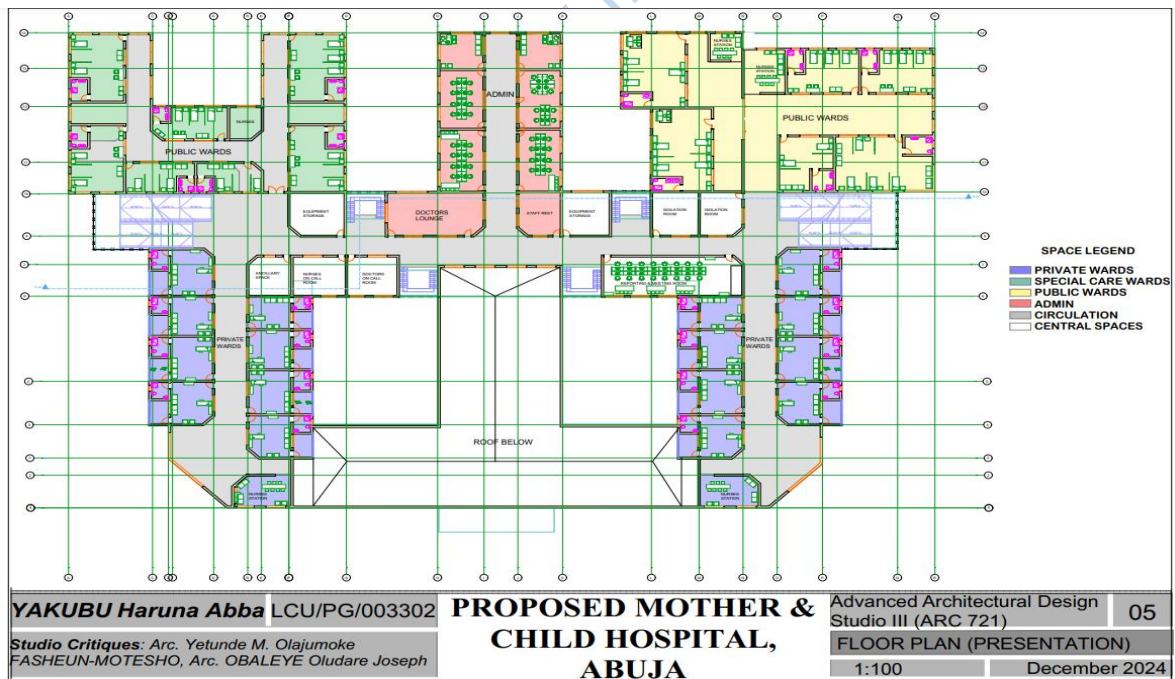
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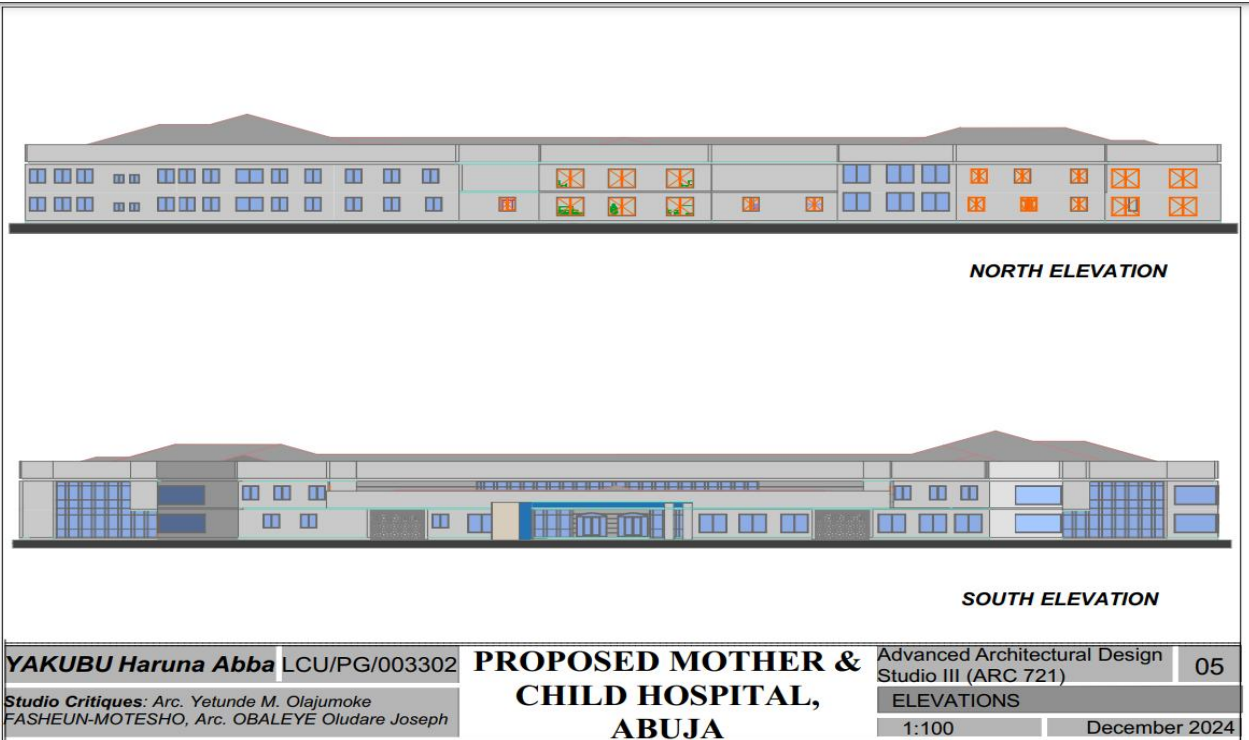
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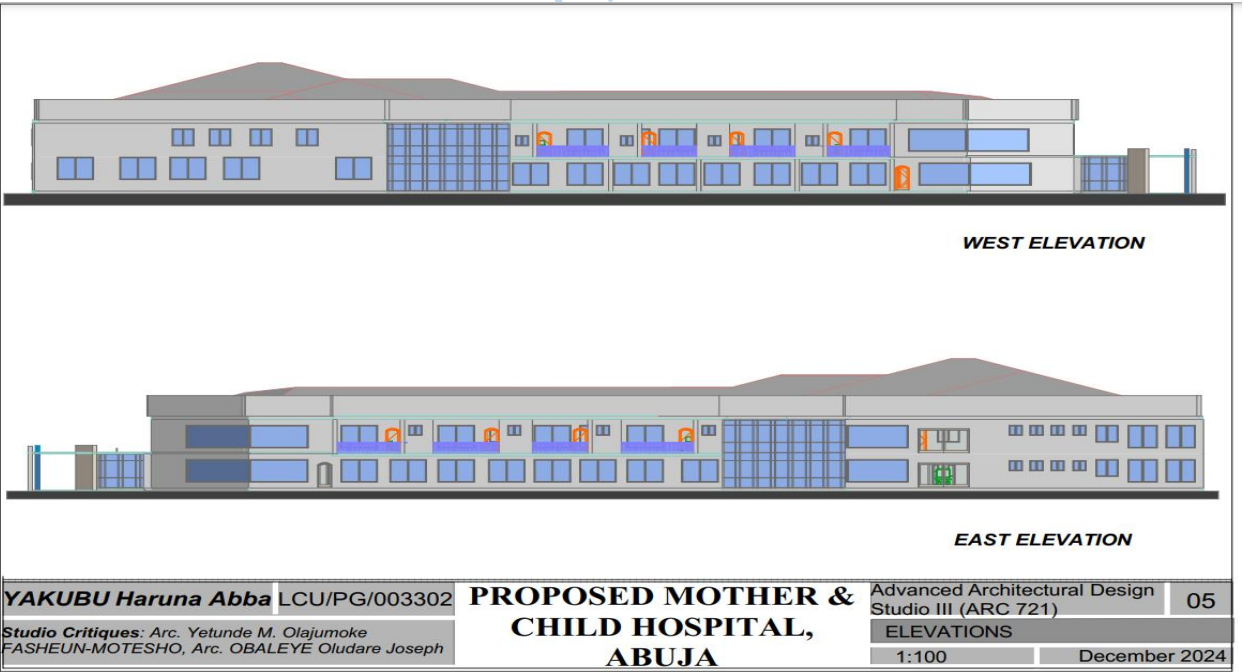
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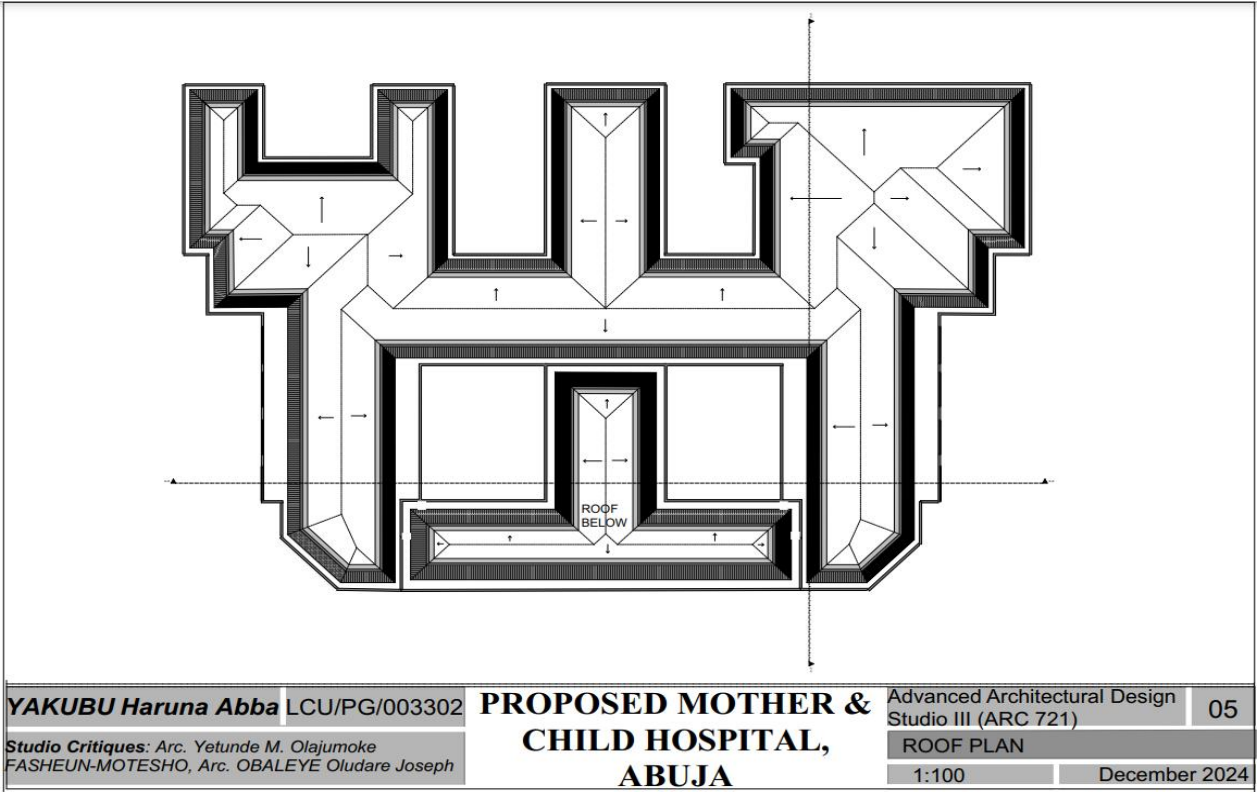
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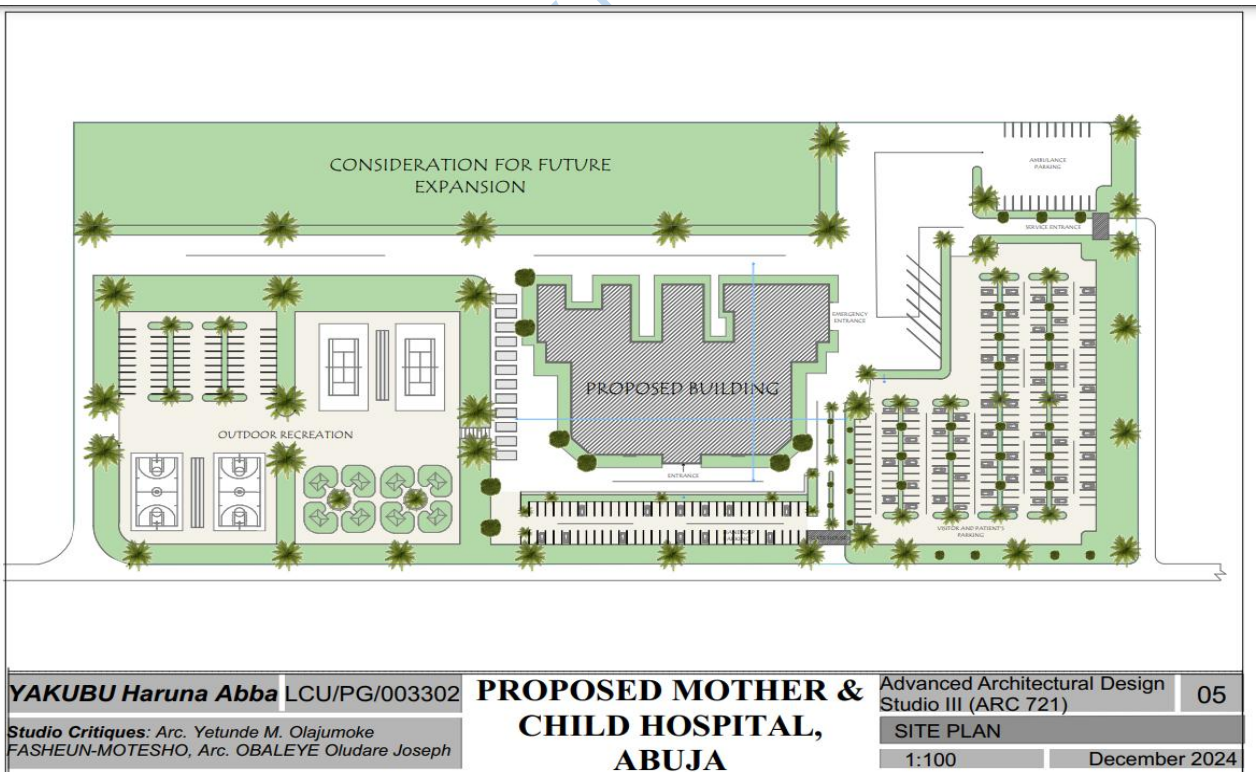
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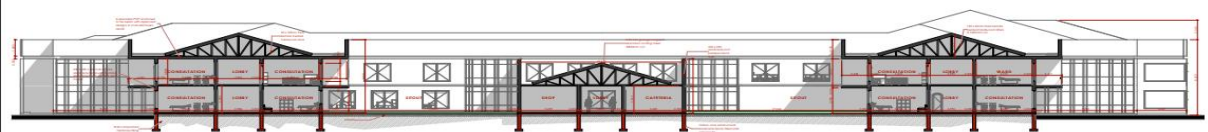
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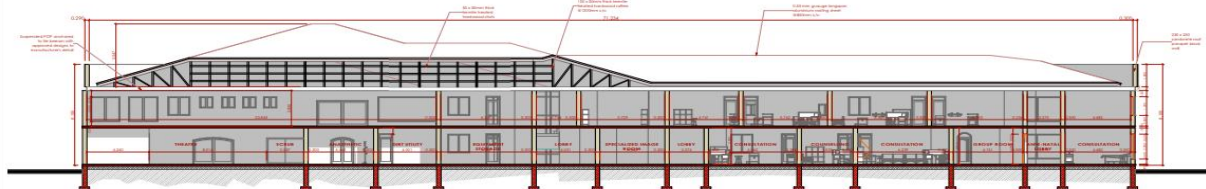
APPENDIX 5



APPENDIX 6



SECTION X-X



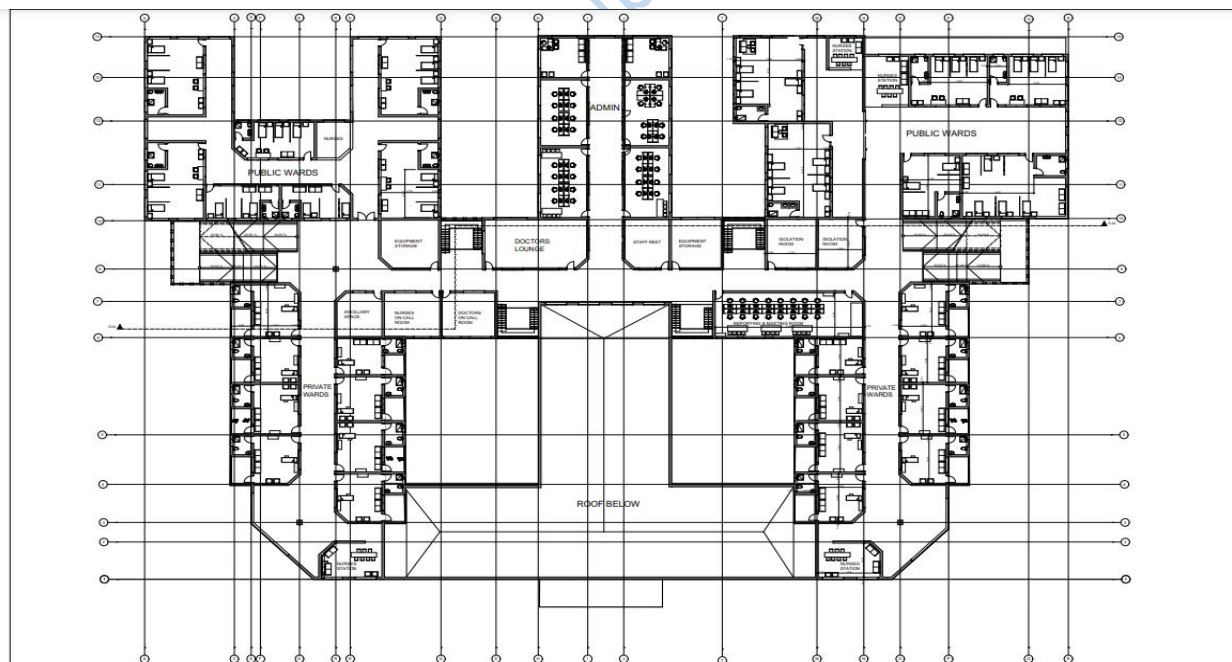
SECTION Y-Y

YAKUBU Haruna Abba LCU/PG/003302
 Studio Critiques: Arc. Yetunde M. Olajumoke
 FASHEUN-MOTESHO, Arc. OBALEYE Oludare Joseph

**PROPOSED MOTHER &
 CHILD HOSPITAL,
 ABUJA**

Advanced Architectural Design
 Studio III (ARC 721) 05
 SECTIONS
 1:100 December 2024

APPENDIX 7

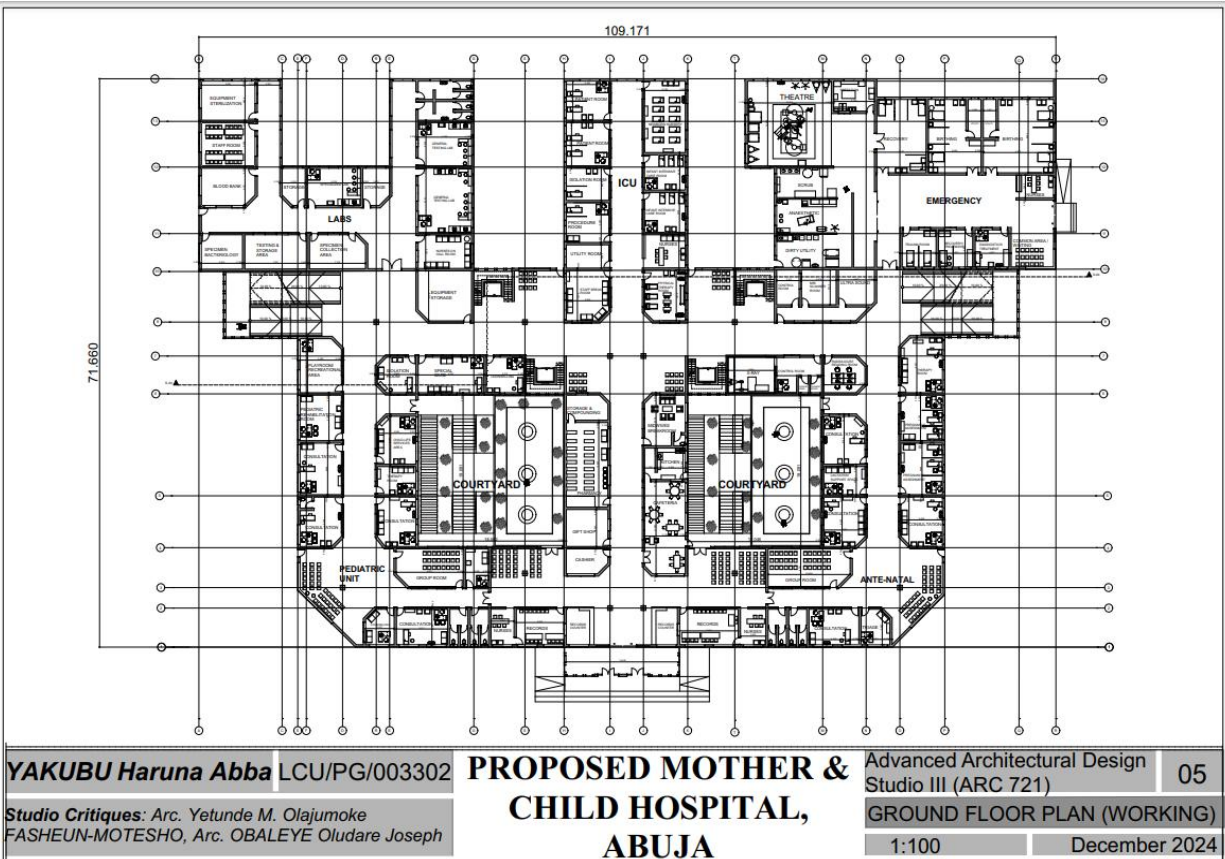


YAKUBU Haruna Abba LCU/PG/003302
 Studio Critiques: Arc. Yetunde M. Olajumoke
 FASHEUN-MOTESHO, Arc. OBALEYE Oludare Joseph

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 CHILD HOSPITAL,
 ABUJA**

Advanced Architectural Design
 Studio III (ARC 721) 05
 FIRST FLOOR PLAN (WORKING)
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APPENDIX 8



APPENDIX 9



APPENDIX 10



APPENDIX 11



YAKUBU Haruna Abba LCU/PG/003302

Studio Critiques: Arc. Yetunde M. Olajumoke
FASHEUN-MOTESHO, Arc. OBALEYE Oludare Joseph

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CHILD HOSPITAL,
ABUJA**

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APPENDIX 12