DAID BOOK OF RESEARCH ABSTRACTS

& SYNOPSES OF DESIGN PROJECTS

EDITOR-IN-CHIEF:
PROF. PAUL MWANGI MARINGA
(PHD), CBS, FAAK, MKIP.

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DEPARTMENT OF ARCHITECTURE AND INTERIOR DESIGN (DAID)

SCHOOL OF ENGINEERING AND ARCHITECTURE (SEA)

KENYATTA UNIVERSITY

DAID BOOK OF RESEARCH ABSTRACTS AND DESIGN PROJECT SYNOPSES

VOLUME I
2023/24 EDITION

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RESEARCH DRIVEN SOLUTIONS FOR THE SUSTAINABLE DEVELOPMENT GOALS 3, 4, 8, 9, 11, 13 & 15
AND
THE CORRESPONDING AGENDA 2063 GOALS 3, 2, 4, 10, 1, 7 & 7 RESPECTIVELY

VOLUME I
2023/24 EDITION

Prof. Arch. Paul Mwangi Maringa (PhD), CBS, FAAK, MKIP, Editor-in-Chief

Department of Architecture and Interior Design (DAID) School of Engineering and Architecture (SEA) Kenyatta University (KU), Nairobi, Kenya.

DEPARTMENT OF ARCHITECTURE AND INTERIOR DESIGN (DAID)
Bachelor's degree research abstracts and design project synopses.

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SCHOOL OF ENGINEERING AND ARCHITECTURE (SEA), KENYATTA UNIVERSITY (KU).

MESSAGE FROM THE CHAIRMAN OF DEPARTMENT:

The Department of Architecture and Interior Design (DAID) at Kenyatta University is recognized for its excellence in architectural education, preparing students for the future through a balance of theory and practical application. With a focus on creativity, sustainability, and innovation, DAID equips students to address modern challenges in the built environment by integrating environmental design principles and advanced technologies. Its distinguished faculty, comprising experienced professionals, ensures that graduates gain both technical expertise and an understanding of global trends. Through hands-on projects and research, DAID graduates are well-positioned to lead in architecture and interior design, contributing to the realisation of pertinent Sustainable Development Goals (SDGs), Agenda 2063 goals, Kenya's Vision 2030 strategies and the National Construction Authority Research Agenda (NACRA).

This serialisation presents a collection of research abstracts and design project synopses from the final year architecture students at the Kenyatta University's Department of Architecture and Interior Design (DAID). The works showcased in this compilation are a testament to the rigorous academic training, creativity, and forward-thinking approaches fostered within the department. Each research project reflects a deep commitment to addressing contemporary architectural challenges, focusing on sustainability, environmental design, and innovative solutions that respond to the dynamic urban and rural landscapes.

The research abstracts highlight critical investigations in different thematic areas that include environmental design, culture and architecture, smart building technologies, equity in education, medical facilities, and urban planning strategies. These studies are grounded in the local contexts where the specific issues under inquiry arise. Despite this focus on context, the various studies reflected here are aligned with global architectural trends, aiming to provide practical solutions to real-world issues. Students have explored topics ranging from bioclimatic principles and sustainable resource management to cutting-edge construction technologies, offering insights that contribute to the advancement of architectural knowledge and practice.

In addition to the research, the design projects in this book demonstrate a diverse range of architectural concepts and solutions. From public facilities to urban resource centers, these projects showcase innovative design strategies that integrate functionality, aesthetics, and sustainability. The students have employed advanced technologies and materials while maintaining a strong connection to local culture and environmental factors. Together, these works illustrate the potential of the next generation of architects to lead the industry in creating sustainable, resilient, and inspiring spaces that meet the needs of communities today and in the future.

Arch., Aidah Munano, CBS, MAAK.
Chairman, Department of Architecture and Interior Design (DAID).

Editorial Note: Architecture is a dynamically transforming profession that embraces inputs from a wide range of disciplines. These articulate the interplay between society, environment and technology. Inquiry into architecture is inevitably a complex exercise in understanding evolving man and the societies s/he is embedded in, their diverse cultures, and endlessly diverse resident environments. This research book draws together novel thought on many such intertwined frontiers of knowledge. It serves well as a catalyst for critical and continuous review of architectural practice. It seeks relevance for architecture to its fluid settings that are forever interacting and forcing continuous change.

This collection of twenty seven research abstracts and design project synopses provokes industry and academia to reflect and interrogate all ideas and solutions for acceptable rationale. It seeks relevance to the issues of societal functions that the built environment seeks to accommodate. The abstracts sequentially review the introduction and background of the physical as well as theoretical context and problem set for inquiry. They display the pertinent research methods applied within the range of environmental behaviour methodology. The resulting findings, conclusions and recommendations bear clear specific orientation to practical local solutions for society, its activities and the environment, while retaining theoretical and global relevance and therefore critical generalisability. These abstracts sequentially and adeptly address the essential queries inquiry of why the study was carried out. What was done? How was it done? What was found? What the findings meant? What was the importance of these findings? In this way, they enable the reader to have an overview of the work without going into great detail.

It is material that all abstracts are followed up with an application of the principles and concepts identified to practical architectural design solutions of real life situations. The design solutions though elaborate in the normal fashion of architectural projects, are rendered here in summary form with critical ideas captured within the design brief, site, concepts and the design. Elaborately annotated design images are added in to complete this illustration of creative design solutions.

The book is ordered into brief chapters long suitable sustainable development goals and their equivalents in Africa's Agenda 2063. Accordingly, the discussion clusters the narratives along the natural sequencing of the third, seventh, ninth, eleventh, thirteenth and fifteenth SDGs and their Agenda 2063 equivalents. For ease of understanding and clarity of focus, the particular goals, themes and sub-themes for each SDG and Agenda 2063 goals are outlined at the beginning of each abstract. Alignment to vision 2030 and the NACRA is given space here too. This provides an orderly articulation of related areas of inquiry and the ideas that anchor them, while affording an easy flow of thought for the reader. The book is an invaluable reference resource for both young and senior researchers as well as industry.

Editor-in-Chief
Prof. Paul Mwangi Maringa (PhD), CBS, FAAK, MKIP,
Adjunct Professor of Architecture and Planning

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BACHELOR'S DEGREE ABSTRACTS

Bachelor's Degree Research Abstracts and Design Project Synopses here feature the following students from the

Department of Architecture & Interior Design (DAID)

Alice Wairimu Ngatia, Maxine Nthenya Mbuva, Melvine Chepkurui, Karen Nyawira Gatamu Dan Kariuki Mwinga, Evans Kainga, Esthlynn Nduta Okhabi, Makori Lenny, Peacejoy Kinya Mutwiri, Michael Macharia Njuguna, Maina Michael Muhuthia, Wamkaya Atieno, Linda Wamuyu Murage, Jamillah Anyango Okello, Jayshree Rehema Osore, Peter Onyango Osore, Njeri Mbugua, Kelvin Gicheha Gachwe, Gregory Ng'etich, Mary Goretty Akoth, Lee Michael Momanyi, Frankline Mogeni Momanyi, Maryam Wangechi, Philip Mungai Kairu, Lawrence Muchiri Muriithi, Aurelia Bosibori Nyamboki.

Sustainable Development Goal 03

Good Health and Wellbeing

Ensure healthy lives and promote wellbeing for all ages

Theme:

Health and population

Agenda 2063 Goal 3

Healthy and well-nourished citizens

Theme:

Health and Nutrition

THE ROLE OF BIOPHILIC DESIGN IN ENHANCING RECOVERY OF DRUG ADDICTS IN REHABILITATION CENTRES.

Researcher: Alice Wairimu Ngatia, B.Arch. Studies, Hons, 2023/4, KU, ngatiaalice610@gmail.com

Supervisor: L.Arch. Regina Wango Kasau, Lecturer DAID,KU, kasauregina@ku.ac.ke

SDG 3: Good Health and wellbeing/**A-2063 G3:** Healthy and well-nourished citizens.

SDG 3 Theme: Healthy lives and wellbeing for all at all ages/**A-2063 G3 Theme:** Health and nutrition.

Sub-theme: Strengthen the prevention and treatment of substance abuse.

Alignment to Vision 2030: This research aligns with the social pillar of Kenya's Vision 2030. This pillar focuses on creating a just and cohesive society, enjoying equitable social development in a clean and secure environment. The purposes this study are embedded in the social strategy whose intention is to invest in the people of Kenya. It has particular relevance to the specific strategy 5.2 regarding the health sector and its enshrined aim of attaining efficient and high-quality healthcare system with the best standards. The specific strategy 5.7 and its concern for equity and poverty elimination is also anchored here in respect of its intention to guarantee equality of opportunity in accessing public services. healthcare objectives.

Alignment to NACRA: The use of biophilic design principles in the research promotes sustainability by integrating natural elements into the built environment which aligns with NaCRA's emphasis on climate change, environmental management and sustainability of the construction industry in its research area 34 and its focus in objective "a" on the impact of construction in Kenya on climate change and pertinent mitigation measures. The attention paid by this research to site planning, privacy, and security contributes to the emphasis of research area 18 of NaCRA, on occupational safety and health in the industry especially with regard to objective "a" that prioritises awareness and observance of safety and health measures.

BIOGRAPHY:

Alice Ngatia is a graduate architect from the Department of Architecture and Design (DAID), Kenyatta University. Alice enhanced her skills at the Department of Projects and Estates, Mama Ngina University taking up roles in architectural drafting and project management. Her passion

lies Her passion lies in designing for wellness and mental health, dedicated to creating spaces that cater to the unique needs of these populations. She focuses on ensuring their comfort and well-being, aiming to enhance recovery and quality of life through thoughtful and supportive environments.

ABSTRACT:

This study investigated the role of biophilic design in enhancing recovery of drug addicts. Drug and alcohol addiction is a social issue affecting many countries globally. Approximately 284 million people worldwide, aged 15-64 use drugs. In Kenya, a survey on the status of Drugs and Substance Use (DSU) 2022, indicated that 1 in every 3 males and 1 in every 16 females were using at least one substance with the largest percentage being attributed to the young people. The study explored the elements of biophilic design and the application of these elements in drug rehabilitation centres. Existing literature on biophilic design elements and design of rehabilitation centres was reviewed and the application of these elements in rehabilitation centres established. A Case study research method where data was collected through observation and interview techniques was used for field access. Two local cases, the Retreat Rehabilitation Centre Redhill, Limuru and The Retreat Rehabilitation Centre Ngong Annex were chosen based on two pertinent inherent factors. These included the interest for a facility that possesses biophilic design principles and accessible rehabilitation centres. The findings indicated that spatial planning with security and safety in mind create a homelike environment. Natural ventilation, daylight and views to natural landscapes were the biophilic elements found to cause improved mental health and quicker healing. The existing biophilic elements effectively contribute to the overall goal of providing a therapeutic environment for patients. Natural ventilation and lighting, views, natural materials and nature inspired colours enhance the therapeutic environment, therefore Rehabilitation centres should consider incorporating these elements.

KEY WORDS: Biophilic design, rehabilitation centres, mental health, therapeutic environments.

DESIGN PROJECT DESCRIPTION: DESIGN OF A WELLNESS AND RESTORATION CENTRE FOR DRUG ADDICTS.

THE SITE:

The site is situated within Murang'a county, in Kiharu constituency, within the Murang'a township location. It shares its proximity with the Murang'a level 5 hospital, a prominent healthcare facility under the regulation of the ministry of health. The site is strategically located near other medical facilities hence they complement one another. Access to the site is available via two primary routes. One stems from a branch of the Murang'a – Sagana road, while the other connects directly from Murang'a town.

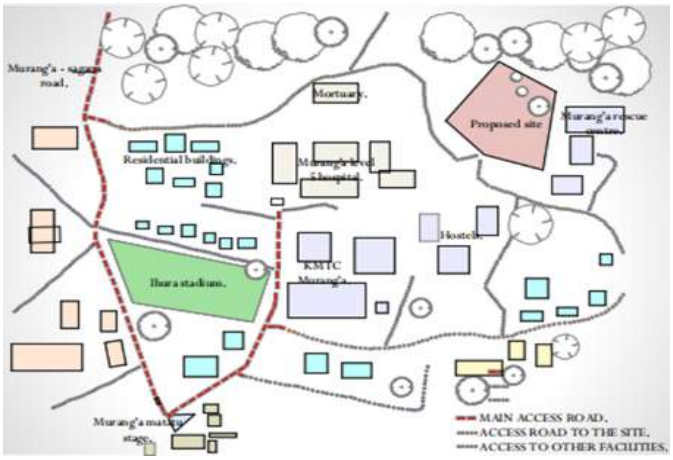

Figure 1: Project location. Source: Author, 2024.

THE CONCEPT:

Figure 2: Therapy and clinic area. Source: Author, 2024.

The project delved into the design of a residential drug rehabilitation centre. The aim of the project was to create a warm and welcoming environment to enhance the healing process. Use of biophilic design elements was the guiding design principle for the project established from the research on the role of biophilic design in enhancing recovery of drug addicts in rehabilitation centres. The major spaces considered in the design were: Administrative spaces, clinic and therapy spaces, patient's accommodation, dining area and recreational spaces.

CONCEPT DEVELOPMENT:

The concept revolves around the theory of biophilia which is the innate human tendency to seek connection with nature and other forms of life. In architecture, it involves incorporating natural elements and processes to create environments that support well-being, productivity, and comfort, ultimately enhancing the human experience within built environments.

Figure 3: Inspiration from informal organic natural forms. Source: Author, 2024.

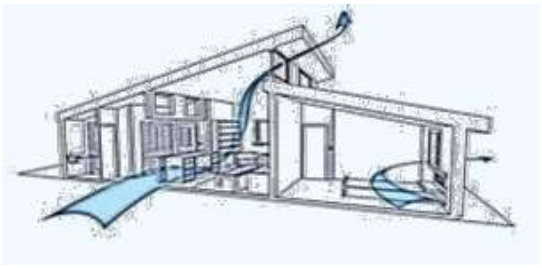

Figure 4: Inviting natural airflows and lighting as well as views inside. Source: Author, 2024.

THE DESIGN:

The design highlighted the necessary use of outdoor and interior spaces, being elements that were associated with direct and indirect connection to nature.

The design of the outdoor spaces provided a direct connection to nature where the patients are in direct contact with the natural world. A variety of plants,

Figure 5:Accommodation unit overlooking the therapy garden. Source: Author, 2024.

water features as well as natural materials were used in the design of a therapy garden evoking the five human senses in order to enhance the overall experience.

Figure 6: Art pieces with images of nature used. Source: Author, 2024.

Indirect connection to nature was enabled through design of interior spaces. Nature inspired colours like blue, green and earthy tones were the main theme colours for walls, furniture and other accessories. Natural materials like vinyl flooring depicting a natural appearance were used for the flooring. Lighting and ventilation were enabled through use of large openable windows that would allow patients to experience the natural world while in their rooms. Windows were also strategically placed to allow for the best views from the interior spaces. To enhance the overall experience while in the indoor spaces, art pieces with images representing nature were used.

Figure 7: Blue, green & earthy colour tones used for walls and furniture/furnishing. Vinyl flooring to depict a natural appearance. Source: Author,

EXPLORING ARCHITECTURAL INTERVENTIONS TOWARDS ENHANCING THE WELL BEING OF PSYCHIATRIC GERIATRIC PATIENTS IN NAIROBI COUNTY, KENYA.

Researcher: Maxine Nthenya Mbuva, B.Arch. Studies. Hons, DAID, SEA, KU, maxinembuva@gmail.com

Supervisor: Mary Wairimu Maina (PhD), lecturer, DAID,SEA,KU, mainawairimu@ku.ac.ke

SDG 3: Good health and well-being. Ensure healthy lives and promote well- being for all at all ages/**A2063 G3** - Healthy and well-nourished citizens.

SDG 3 Theme: Access universal health coverage, and quality healthcare services /**A2063 G3 theme:** Health and nutrition.

Sub-theme: Environment (Therapeutic, dignified, and supportive spaces) & behaviour (healing, better health, and contentment).

Alignment to Vision 2030: Research here is anchored on the social pillar of Kenya's Vision 2030 that seeks to achieve a just and cohesive society enjoying equitable social development in a clean and sur environment. It contributes to the Social strategy that advocates for investment in the people of Kenya. More specifically it is guided by the specific strategy 5.2 on the health sectors, whose primary goal is to provide an efficient and high-quality health system with the best standards while reducing inequalities in access to health care systems. This inquiry supports the objectives of (1) improving healthcare infrastructure and services by addressing the specific needs of a vulnerable population, (2) promoting social inclusion and equity through tailored environments and (3) supporting the goal of ensuring equitable access to healthcare for all citizens.

Alignment to National construction research agenda NACRA: Research here aligns to the specific technical discipline of the National Construction Research Agenda (NACRA) of (4) Risk and safety management. Within this discipline the study specifically addresses research area (19) on the drive to ascertain maintenance of functionality (suitability, convenience, and comfort) of construction products infrastructure and buildings. Of material relevance here is the inherent objective (a) of this research area that advocates for the need to ascertain suitability, convenience, comfort and functionality of construction products for use especially by people with physical disabilities and the elderly.

BIOGRAPHY:

Maxine Nthenya, graduate architect from the Department of Architecture and Interior Design (DAID) at Kenyatta University, brings a rich academic background and professional experience to her pursuits. During her tenure as a student, she notably served as the Public Relations Manager for the Architectural Students Association, showcasing her leadership abilities and commitment to the field. Through engagements at Renaissance per Salut Architects and the State Department for Public Works, she refined her expertise in pioneering sustainable design methodologies. Her academic interests converge on the intersection of environment and psychology as they both influence behaviour of users of built-up spaces.

ABSTRACT:

The aging population is increasing rapidly worldwide, intensifying the need for effective geriatric care. Among the critical aspects is the psychological well-being of elderly individuals. This inquiry explored how thoughtful architectural design can address the diverse needs of elderly residents in Nairobi City County. By examining physical, psychological, social, and cultural factors, the study illustrated how architectural interventions could improve the quality of life for elderly individuals. Focusing on thematic analysis, this research identified architectural strategies that support elderly residents diagnosed with Alzheimer's and dementia within Nairobi's nursing homes. Through focused and individual interviews as well as observations, it highlighted how well-designed spaces directly enhanced the living experiences of this demographic group. The study focused on themes that emerged from the perspectives of residents, caregivers, and stakeholders, with an aim to determine how environments could better meet cognitive, emotional, and physical needs during this stage of life. Key findings showed that elderly care facilities necessarily needed to address diverse needs spanning physical impairments and dementia-related vulnerabilities. It was established that person-centered care, which tailored environments to individual preferences, and the therapeutic milieu, which in turn promoted psychological health through scientifically structured spaces, were essential for use in design. It also emerged and was therefore recommended that integrating biophilia through the use of natural elements within the built environment also created restorative experiences. Such an approach to design was therefore recommended. It was essential for design to consider spatial zoning, ventilation, lighting, and safety-focused elements that enhanced comfort and autonomy. The study also confirmed that communal areas that promoted social interaction and nature-centric features further contributed to a nurturing environment. Designs therefore need the creation of such spaces in built environments for geriatrics. Ultimately, this comprehensive approach to architectural design supported the well-being of psychiatric geriatric patients by offering therapeutic, dignified, and supportive spaces in the journey towards healing, better health, and contentment in Nairobi City County.

KEY WORDS: Well-being, psychiatric geriatric patients, person centered care, biophilia, therapeutic milieu.

DESIGN PROJECT DESCRIPTION : PSYCHIATRIC GERIATRIC CARE FACILITY

THE PROJECT BRIEF:

The project addresses the establishment of a Psychiatric Geriatric Care Facility within the existing Mathari National Teaching and Referral Hospital in Mathare constituency, Nairobi. This initiative, that is driven by the Ministry of Health, aims to address the unmet mental health needs of the aging

population, particularly those residing in low quality urban settlements. The facility will be integrated within the existing infrastructure, maximizing resources and expertise for interdisciplinary collaboration in holistic treatment.

Figure 1: Proposed master plan. Source: Author, 2024..

THE SITE:

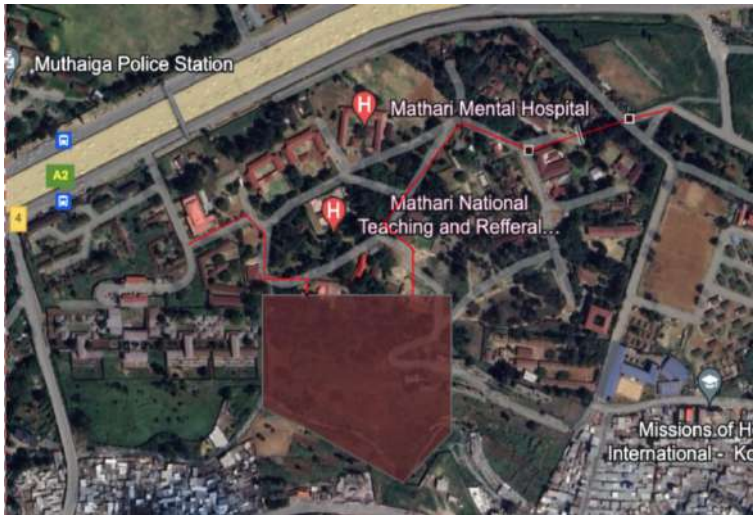

Figure 2: Site Location. Source: google map, https://maps.app.goo.gl/1dcAhRDqCoCHEPZB8

The elderly population in Mathare and neighbouring constituencies face challenges related to physical, mental, and emotional well-being. The status is exacerbated by isolation, limited medical care, and social support. Existing healthcare facilities lack comprehensive geriatric care services. This necessitates a specialized centre to provide tailored care and support. The primary objective is to enhance the psychological, physical, and social well-being of elderly residents. This will be achieved through sufficient

healthcare services, promotion of social interaction, personalized care, and creation of a safe living environment that slow the progression of dementia.

THE CONCEPT:

The main concept that influenced the design of the facility was the De Hogweyk care model. This is a Netherlands based concept that guides the deinstitutionalization of the traditional nursing home concept. It encourages the study of the lifestyles of the elderly residents in order to design an environment that is familiar to them. This led to the focus on the aspect of community living which is common to the African context. The design intended to foster the creation of intimate communities that eventually initiate social relationships that positively contribute to their well-being.

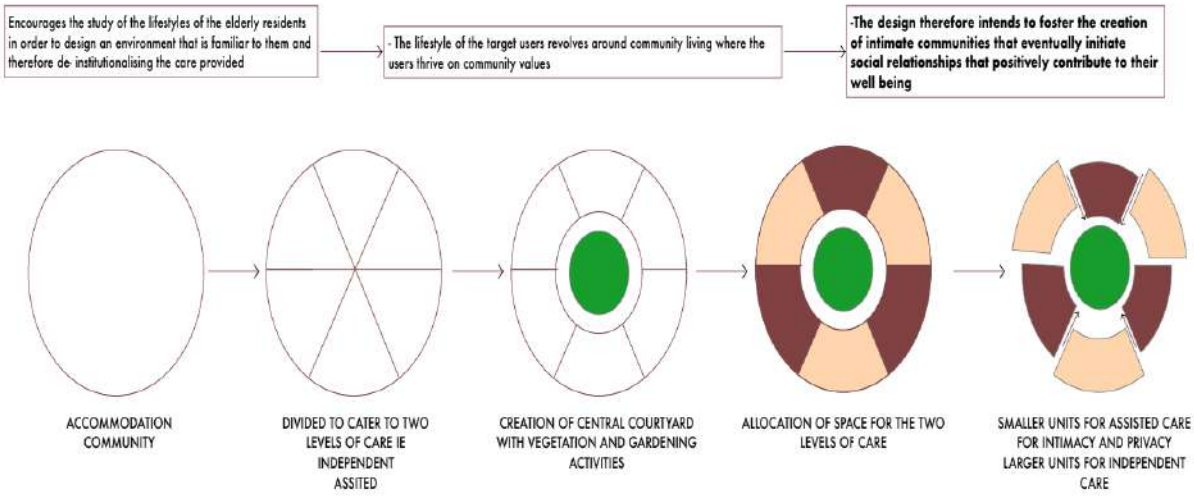

Figure 3: Concept development. Source: Author, 2024.

The design of the wellness centre was also guided by biophilia as the theme that depends on human interaction with nature, to enhance the well-being of the elderly individuals. Through its six principles namely, environmental features, natural shapes and forms, natural patterns and processes, light and space, place-based relationships and evolved human-nature relationships, the design acquired its master plan, forms and space allocations.

THE DESIGN:

The facility is a memory care facility offering comprehensive services such as gerontological counselling, cognitive activities, medical care, and physiotherapy. It fosters interaction with the community, family, and other residents. Additionally, the centre will serve as an educational hub for geriatric psychiatry, facilitating research and innovation to enhance the quality of life for the elderly population.

Spatial programming

The design of the psychiatric geriatric care facility integrates a comprehensive spatial programme that is informed by extensive literature, precedent, and local case studies. This programme

addresses the well-being of residents through five key categories. These include administrative spaces, accommodation areas, healthcare facilities, utility areas, and common social spaces. Each of the spaces is tailored to support the holistic care and health of psychiatric geriatric patients.

Physical indoor environment

The design for the psychiatric geriatric care facility integrates several key lighting considerations to ensure an environment conducive to the well-being of elderly patients. The lighting scheme is designed to be consistent and evenly distributed, minimizing areas of shadow and glare, thus enhancing visual comfort. Gradual transitions in light levels, coupled with focused task lighting, are incorporated to accommodate varying activities and to aid in the detection of visual contrasts. The dining area is specifically designed to be well-illuminated, allowing patients to fully engage with and appreciate their meals. Care is taken to avoid overpowering or glaring light sources, ensuring a gentle yet effective illumination throughout the facility.

Figure 4: Lounge Interior design. Source: Author, 2024.

Figure 5: Dining area interior design. Source: Author, 2024.

The interior design also aimed at improving the acoustical environment via the use of sound-absorbing materials for example curtains and tactile floor covering. Open space plans have also been found to improve wayfinding, where the elderly can use auditory cues for orientation.

Figures 6 & 7: Sleeping area interior design. Source: Author, 2024.

Interior design

The design also incorporates carefully selected colours that contribute to a warm, calming, and tranquil environment. These colours not only create contrast for improved wayfinding and space identification but also enhance the overall aesthetic appeal of the facility

Biophilia

The incorporation of biophilic principles is seen in the beautifully landscaped outdoor spaces, which are easily accessible to residents. This intentional design not only provides aesthetically pleasing surroundings but also facilitates exposure of residents to nature. It offers restorative effects that mitigate the risk of cognitive decline. The thoughtful integration of nature within the built environment aligns with the thinking of biophilia, emphasizing the important human affinity for nature and its positive impact on well-being.

Figure 8: Central landscaped area with provision for landscaping. Source: Author, 2024.

Security and privacy

The design of the care facility incorporates strategies to foster intimacy among residents and their families, supporting both individual and group activities. Privacy measures are emphasized to nurture personal connections and family engagement, enhancing well-being residents. Security and privacy are balanced with dignity and autonomy, with diverse room types, communal areas, and bathrooms allowing for personal choice. Architectural features such as ramps, rails, and textured pathways further support the independence of residents, ensuring they can navigate the environment safely and with ease.

Figure 9: Seating and basking areas with water features and carefully selected plants. Source: Autor, 2024.

The proposed memory care facility is a thoughtfully designed environment that prioritizes the holistic well-being of its residents. By integrating comprehensive spatial programming, carefully curated interior elements, and biophilic design principles, the facility promotes a warm, secure, and supportive atmosphere that is conducive to both individual and communal activities.

Figure 10: Accommodation cluster. Source: Author, 2024.

The purposed emphasis on privacy, autonomy, and accessibility ensures that residents can maintain their dignity while engaging with family, community, and nature.

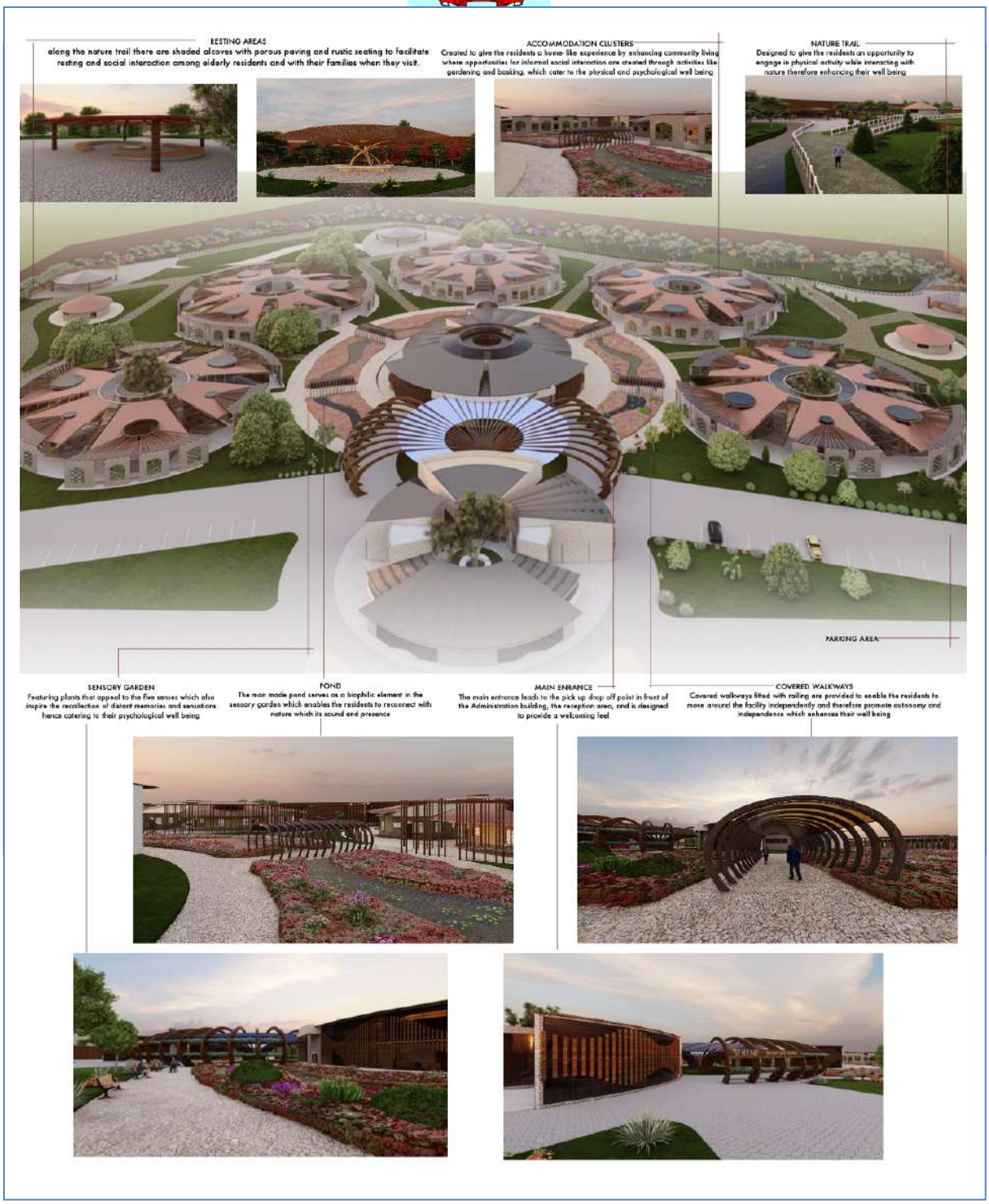

Figure 11: Project overview. Source: Author, 2024.

PLANNING AND DESIGN OF BIRTH ENVIRONMENTS: A Case of Nairobi Maternity Hospitals, Kenya.

Researcher: Melvine Chepkurui, B.Arch. Studies. Hons, 2023/4, DAID, SEA, KU, melvinechepkurui@gmail.com

Supervisor: Dr. Rehab Elnaggar, (PhD), EEE-EES, Lecturer, DAID, SEA, KU, rehab.elnaggar@ku.ac.ke

SDG 3: Good Health and Well-being/**A-2063 G3:** Healthy and well-nourished citizens.

SDG3 Theme: Ensure healthy lives and promote well-being for all at all ages/**A-2063 G3 Theme:** Health and Nutrition

Sub-theme: Efficient Maternal and Child health spaces.

Alignment to Vision 2030: The Kenya's Vision 2030 is anchored on three pillars; economic, social and governance – politics. The research is focused on the social pillar of Kenya's Vision 2030, which aims at creating a comprehensive, equitable and just society and in a clean and secure environment. This aim is addressed here through the social strategy whose intention is to invest in the people of Kenya through the specific sector (2) on health with the avowed provision of an efficient and high-quality health care system. Under this social pillar, the health sector is expected to be principle catalyst for the realization of Vision 2030. Good health boosts the capacity the human resource to be productive. This in turn enhances economic growth and contributes to poverty reduction; and to the specific strategy (4) of environment with its commitment to a clean secure and sustainable environment.

Alignment to NACRA: Research here also embraces the specific technical disciplines of the National Construction Research Agenda (NACRA) 1 on construction technology and materials; and 5 on environment.

BIOGRAPHY:

Melvine is a graduate of the Department of Architecture and Interior Design at Kenyatta University. She has experience working with firms like Renaissance Per Salut Architects and Design infinity Architects. In these offices she refined her design and teamwork skills working on various residential and commercial projects. Her research focus is on the relationship between the built environment and user well-being, as well as the resulting insights for the related design processes. Melvin is passionate about sustainable design practices, that aim to create spaces that enhance community well-being and environmental sustainability, and thereby promoting healthier and more sustainable living.

ABSTRACT:

This study examined planning and design of birth environments in order to determine the influence of the design of birth environments on labour and birth, birth health outcomes and childbirth experiences. It explored the spatial design characteristics of birth spaces that promoted the health and well-being of women. Many studies have underscored the value of the physical environment of the hospitals for the health and well-being of patients. There is also the consideration in environments of birth, where the ability of a woman to give birth, and her experience of childbirth may be affected by the setting. In the field of research on architecture for birth places, there is a dearth of information on the description of the impacts of physical characteristics of environments of birth on the health and well-being of women, especially during labour and birth.

Review of pertinent literature was carried out to identify suitable planning and design aspects of the environments for birth. This survey of literature delved into ways in which the physical characteristics of the birth spaces influenced labour and birth. Key features of the environment for birth were in this way identified and made available for field inquiry. These included, spatial layout, birth room configuration, birthing facilities and control of indoor environmental quality. Aspects investigated in spatial layout configuration include spatial relationships, visual and acoustic privacy, wayfinding, social spaces, circulation and staff efficiency. Birth room considerations looked at room shape, type and size, room flexibility, access to nature and provisions for support persons as well as birthing aids. Indoor environmental quality examined the benefits of giving women patients the ability to control factors such as room illumination and temperature, visual control and ventilation.

The case study and observation research methods were used complementarily, guided by the filed tools of annotated checklists, sketches and photographs to probe maternity hospitals in Nairobi. In this manner, data was gathered on the available complement of design aspects and the manner in which they were disposed in the hospitals. The perceptions of patients regarding these spaces was also probed using focus group and individual respondent interviews that relied on questionnaires and structured interview schedules.

It was found that the hospital had taken into consideration the design aspects that were being investigated, which resulted in increased user satisfaction and quality of care. Well-designed physical environments of birth spaces through well-articulated spatial layout configuration considering privacy gradient, spatial proximity, noise control, circulation, provision of social spaces and wayfinding cues were recommended. Birth room internal design such as room flexibility, shape and size, room standardization access to nature and provisions for support persons were deemed crucial. Further, birthing facilities that aid women during labour are essential in supporting the practice of childbirth, and provisions for control over indoor environmental quality such as lighting, ventilation, temperature and views enhance birthing experiences. These design features were recommended for use in enhancing health and well-being of women during childbirth. Such maternity spaces would serve effectively as places of support for the holistic health and wellness of mother and baby.

KEY WORDS: **Birth environment, physiological labour, good health, birth architecture.**

DESIGN PROJECT DESCRIPTION: THE BIRTH CENTRE.

THE SITE LOCATION AND BRIEF:

The Birth Centre is located within Nairobi Business Park along the now dualled Ngong' Road, a primary arterial access road into the Nairobi City County. Its site is surrounded by a middle- & high-income low rise residential neighbourhood that is fast transforming into a Highrise mixed use residential-cum-commercial hub.

Figure 1: Site location. Source: Author, 2024; Adapted from Google earth, https://earth.google.com/web/search/Nariobi+Bussiness+Park,

Conventionally, birth spaces are designed to carry out clinical procedures and medical interventions creating an experience that feels institutional. There is need to alter the traditional cold impression of the maternity spaces to a warm and serene sensory atmosphere. This was the focus in this project, to transform the design of local birth environments by creating a prototype where women are most likely to feel safe, relaxed and supported in their birth spaces. This interest is consistent with the emerging contemporary trend where the design of maternity spaces is currently changing. Birth spaces are being transformed and changed into holistic, woman-centered facilities, that create more suitable and better birth spaces for women.

THE CONCEPT:

The design of the proposed Birth Centre is anchored on the concept of domesticity. It aims to achieve a domestic character by incorporating elements that make the birth environment feels like home rather than a typical clinical setting. It is designed to be domestic, comfortable, pleasant and calm. It provides spaces intended for the well-being of women.

Figure 2: Front view of the design. Source: Author, 2024.

Figure 3: Aerial view of the site. Source: Author, 2024.

THE DESIGN:

The birth centre is embedded within the park. This disposition gives it access to a variety of outdoor spaces and a seamless connection with nature. It affords it serenity and tranquillity. In this posture, the goal is to establish a logical connection between the developed area and the natural surroundings. The project ventured to develop a birth environment design that is infused with an

architectural style that reflects its immediate context of the distinctive Nairobi Business Park. Such a disposition integrated it seamlessly with the existing developments in the area.

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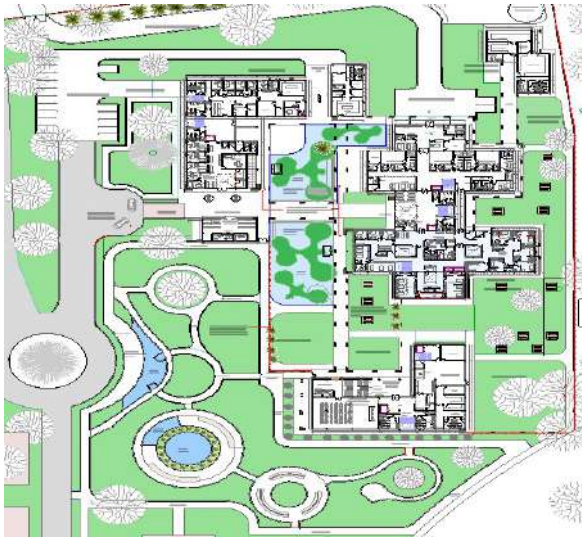

Figure 4: Site plan. Source: Author, 2024.

Figures 5 & 6: Perspective views. Source: Author, 2024.

The birth centre is embedded within the park, giving it access to a variety of outdoor spaces and a seamless connection with nature, resulting in a general serenity and tranquillity. The goal is to establish a logical connection between the developed area and the natural surroundings.

The project mandated the development of a birth environment design seamlessly infused with architectural style distinctive to Nairobi Business Park, integrating it with the existing developments in the area.

Programme spaces:

1. Women clinic
2. Diagnostic department
3. Admin Block
4. Delivery Suite
5. Emergency & Theatre
6. Postnatal Units
7. Neonatal Unit
8. Maternity Waiting Homes
9. Public Spaces
10. Support spaces such as Kitchen, Laundry, Public areas

Key elements that contribute to a calming and reassuring birth environment as recommended in the thesis, and which guided the design of the Birth Centre include:

Figures 7 & 8: Elevations. Source: Author, 2024.

(1). Configuration of the spatial layout: Wayfinding is achieved through the use of simple rectangular shape with clear sightlines to provide orientation and facilitate clarity of movement for the users. The needs and hierarchies of spatial proximity (privacy gradients) were identified and respected in order to provide acoustic and visual privacy for the most protected areas, the deluxe suites. Access to nature was accorded achieved by blending the facility with its surrounding landscapes. This provided access to a variety of outdoor spaces in a seamless connection to nature. It gave the centre a sense of tranquillity and serenity. Efficiency of service by staff was also supported by adapting a spatial organization that promoted functionality and control of these space by these staff. Social spaces for social interaction were provided in order to afford the women necessary psychological well-being during labour, by locating birthing suites away from noisy environments. Further, acoustic privacy was enhanced by locating birth suites away from noisy environments in a fashion that guaranteed them appropriate acoustic isolation.

Figures 9 &10: Elevations. Source: Author, 2024.

Figures11, 12 & 13: Perspective views. Source: Author, 2024.

(2) Configuration of the birthing rooms: The birthing rooms were designed to be spacious in order to encourage mobility for the women. They also gave space for social support functionaries to foster family functioning in complementation with broader social support.

This enabled high levels of social support that are associated with reduced stress and increased levels of wellness in patients.

The design integrated the concept of flexible non-standardized rooms that therefore had the ability to adapt to different layouts, to suite different preferences of the women patients.

(3). Birthing aids:
These were included in the design in order to offer support for different activities of women in labour.

(4). Provisions to control indoor environmental quality:
Consideration was given to lighting, ventilation, temperature and views as these enhanced the well-being of women patients and in this way improving the overall birth experience.

Sustainable Development Goal 04

Quality Education

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Theme:

Inclusive Education

Agenda 2063 Goal 01

Well-educated citizens and skills revolution underpinned by science, technology, and innovation.

Theme:

Education and science, technology, and innovation (STI) driven skills revolution.

THE INFLUENCE OF CHANGING USER NEEDS ON THE DESIGN AND FORM OF LIBRARIES.

Researcher: Karen Nyawira Gatamu, B.Arch. Studies. Hons, 2023/4, KU, gatamukaren@gmail.com

Supervisor: Paul Mwangi Maringa(PhD), CBS, FAAK, MKIP, Adjunct Professor of Architecture & Planning, DAID, SEA, KU, pmmaringa2013@gmail.com

SDG 4: Quality Education/**A-2063 G2:** Well-educated citizens and skills revolution underpinned by science, technology, and innovation.

SDG 4 Theme: Inclusive Education/**A-2063 G2 Theme:** Education and science, technology, and innovation (STI) driven skills revolution.

Sub-theme: Effective Neighbourhood Learning Community Environments.

Alignment to Vision 2030: Inquiry here is premised on an intensified application of Science, Technology, and innovation (STI). This is foundation is contrived to increase productivity and efficiency across all three pillars (economy, society & governance – politics) of Kenya's vision 2030. Specific focus is brought to bear here on the social pillar of Kenya's Vision 2030. This pillar aspires for a just and cohesive society, with equitable social development and in a clean and secure environment. This aim is addressed here through the social strategy whose intention is to invest in the people of Kenya through the four specific goals of (1) education & training; (4) a clean secure and sustainable environment; (5) adequate, decent and high-quality urban livelihoods; and (6) equality of opportunity in accessing public services and providing income generating activities in a drive to achieve equity and poverty elimination.

Alignment to NaCRA: Research here also embraces research in the specific technical disciplines of the National Construction Research Agenda (NaCRA) of (1) construction technology and materials; and (5) Environment.

BIOGRAPHY:

Nyawira Gatamu is a graduate architect from the Department of Architecture and Design (DAID) of Kenyatta University, where she served as the Organizing Secretary for the Architectural Student Association. She refined her skills at Archmould Planning Systems and Arcs Africa Limited, developing notable experience in innovative and sustainable design solutions. Her passion lies in environmental behaviour studies focusing on the psychological impact of the built environment on its occupants. Nyawira's research seeks to unravel the relationship between architecture and user

well-being. She is the Founder of Not A Crit, a magazine start-up that bridges the gap between architecture and media.

ABSTRACT:

The study sought to profile the application of human-centered design in libraries. It explored the development of libraries from Mesopotamian to modern times. Different architectural styles adopted by libraries over the years, including contemporary floating and the human library were also examined. The inception of libraries in Kenya, which began in colonial times was looked at too. Public libraries are no longer useful to a transformed majority user population. It was necessary therefore to delineate the met and unmet needs. Guided by Abraham Maslow's hierarchy of needs and Logan and Everall's pyramid of library needs, a conceptual framework emerged where community needs, and community resources pooled to form the Minimum Viable Product (MVP) as the spine of the library. Such an MVP ensured that the convenience, connection, and incubation needs of its patrons were equally catered for and the library enabled to grow its capacity and acquire more resources. The resulting system was a positive feedback loop that ascertained adaptation to changing needs. The case study method guided by observation and interviews was used to review libraries in the low-, middle- and high-income areas, thus, Kaloleni, Buruburu and Maktaba Kuu Library respectively. Most libraries met the convenience needs of their patrons, but not so for the connection and incubation needs. Bigger libraries tended to only fulfil general needs rather than specific community needs. It also emerged that a library that met the convenience, incubation, and connection needs of a population effectively also served as a good community library.

KEY WORDS (6/6 Words): **User convenience, connection and incubation needs.**

DESIGN PROJECT DESCRIPTION: A USER-CENTERED LIBRARY IN KIAMBU

THE SITE:

The site selected for the library is in Kiambu town. This library would supplement the only existing one in Thika, benefiting the many educational institutions in Kiambu. Its proximity to Nairobi enhances the services provided by the libraries in Nairobi.

Figure 1: Kiambu Library. Source: Author, 2024.

THE PROJECT BRIEF:

Combining Maslow's Hierarchy of Needs and the Logan and Everall Pyramid of Library Needs, the design aimed to create a user-centered library by addressing three specific needs: convenience, connection, and incubation.

Figure 2: Front perspective. Source: Author, 2024.

Figure 3: Rear perspective view. Source: Author, 2024..

Figure 4: Children's Library. Source: Author, 2024.

Convenience needs

The library was designed to offer adequate lighting, ventilation, accessibility, and comfortable spaces, with a variety of areas tailored to different user groups:

- Kids' Spaces: Designated areas for reading aloud and storytelling sessions to foster literacy and imagination. Interactive zones with educational games and puzzles encourage exploration and cognitive development. Quiet corners or cozy nooks provided focused reading and relaxation spaces.
- Elderly Spaces: Comfortable seating with ergonomic furniture that fosters relaxation and socialization. These spaces promote social engagement and lifelong learning within a supportive community setting.

Figure 5: Personal workstations. Source: Author, 2024.

Figure 6:Coworking space. Source: Author, 2024.

- Adult Spaces: Versatile areas to meet diverse needs, including quiet reading areas, collaborative zones with group study rooms, multimedia resources for professional development, and tech hubs.

Connection needs

Figure 7: Mixed lounge. Source: Author, 2024.

The library included spaces that facilitate socialization and connection among patrons: Several break-away areas for individualized use of communal spaces, a mixed lounge for relaxed interaction, and a multifunctional restaurant for social gatherings.

Incubation needs

The library supported the professional advancement of the Kiambu community, focusing on agriculture and entrepreneurship. The incubation zone featured:

- Artisanal Market: A space for entrepreneurs to showcase products, reach new customers, and grow their businesses.

Figure 8: Greenhouse. Source: Author, 2024.

- Food Processing Kitchen: Provided access to commercial-grade equipment and industry practices, enabling practitioners to add value to their produce through processing, packaging, and preservation techniques.
- Greenhouse: Offered hands-on learning opportunities in agriculture, providing insights into plant cultivation techniques, crop management practices, and access to specialized resources and expert guidance.

This user-centered design ensured the library met the diverse needs of its community, enhancing convenience, fostering connections, and supporting professional growth.

EXPLORING APPROACHES TO INCLUSIVE ARCHITECTURE FOR PEOPLE WITH VISUAL DISABILITIES: A CASE OF THIKA HIGHSCHOOL FOR THE BLIND.

Researcher: Dan Kariuki Mwinga, B.Arch. Studies, Hons., 2023/4, DAID, SEA, KU, dmwinga7@gmail.com

Supervisor: Dr. Rehab Elnaggar, (PhD), EEE-EES, Lecturer, DAID, SEA, KU, rehab.elnaggar@ku.ac.ke

SDG 4: Inclusive education and learning opportunities for all/A-2063 G2: Inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG 4/A-2063 Theme: Well-educated citizens and skills revolution underpinned by science, technology, and innovation.

SDG 4/A-2063 Sub-Theme: Education and science, technology, and innovation (STI) driven skills revolution

Alignment to Vision 2030:
This inquiry seeks to enhance the accessibility and usability of architectural spaces to create inclusive architecture in order to achieve a more equitable built environment for the well-being, autonomy, and dignity of individuals with visual disabilities. This interest is a concern of the social pillar. And particularly so for the specific, social strategy 5.6 that emphasises investing in the people of Kenya especially with consideration for in gender, youth and vulnerable groups.

Alignment to NACRA: The research supports research in the specific technical discipline 1 on Construction technology and materials within the overall National Construction Research Agenda (NACRA) that seeks to attain quality in the built environment.

BIOGRAPHY:
Dan Mwinga is a graduate architect of the Department of Architecture and Interior Design (DAID), Kenyatta University. He has dedicated his learning time to exploring the intersection of inclusive design and environmental design, with a particular focus on enhancing accessibility for people with special needs. He has had research and design exposure to creating conducive outdoor learning spaces that emphasize the interaction between human senses and the outdoor environment to improve on the overall learning experience. He gained industrial experience earlier on at AIA Architects and at Sancas Architects in professional work that included interior design Mwinga is passionate about reviewing and video editing holiday homes with an emphasis on interior design.

ABSTRACT:
Kenya, like many other nations, faces a great challenge in creating architectural spaces that are inclusive of people with visual impairments. Although progress has been made in recognizing the significance of inclusivity, there is still a notable gap in the use of efficient design strategies that address the particular requirements of the visually impaired individuals. For those who are visually impaired, this inequality not only makes life more difficult on a daily basis, but it also makes it more difficult for them to access opportunities for job, education, and leisure. The lack of clear and widely implemented inclusive architectural methodologies presents a significant obstacle to the development of environments that enable and support self-sufficient living for Kenya's visually impaired population.

This research delved into the approaches and strategies that underpin inclusive architecture for individuals with visual disabilities. It explored practical measures, design considerations, and spatial arrangements to enhance the accessibility and usability of architectural spaces for this user group. Furthermore, it emphasized the broader significance of inclusive architecture in creating a more equitable built environment. It prioritized not just compliance with accessibility standards but also the well-being, autonomy, and dignity of individuals with visual disabilities.

The study focused on secondary schools, addressing a gap left by previous studies that primarily considered tertiary institutions and elderly homes. It examined the multisensory responsiveness in design, materials used in construction, their textures and colours, and their impact on visually impaired individuals. It highlighted design parameters for the visually impaired, with special attention to sensory impressions and circulation within the built environment.

The study employed the environmental behaviour and survey research methodology. It relied on the case study and observation methods in complementation. Thika school for the blind in Thika, Kiambu was selected using judgemental sampling given its status as a local model school. The Hazelwood school for the blind in the United Kingdom is also selected for a desktop review. It was favoured for use here on account of its detailed attention to the needs of the visually impaired. A critical finding of the study was that while the Thika school for the blind integrated assistive technology for student movement, it overlooked multisensory environmental impressions crucial for the visually impaired. Arising out of this finding and others regarding the issues that were probed here, Use of materials that emit unique scents in buildings was recommended. Intentional placement of textured materials, strategic positioning of activities and materials that produce distinct sounds was also advised. Utilizing colour contrast between structural elements like walls, floors, and handrails was also recommended for use in the design of buildings and their supporting external spaces.

KEYWORDS: **Inclusive, visual disabilities, accessibility.**

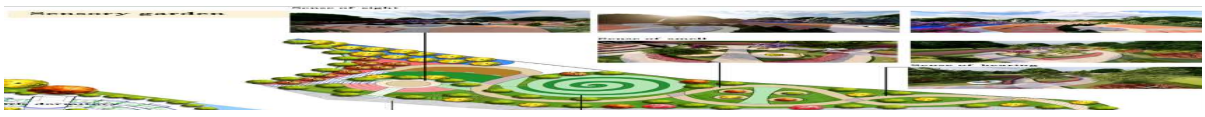

Figure 1: Sitting arrangement of the olfactory zone. Source: Author, 2024.

PROJECT DESCRIPTION: DESIGN OF A MULTISENSORY SCHOOL FOR THE VISUALLY IMPAIRED.

THE SITE:

Figure 2: Map of Kiambu County. Source: Kabubi et al, CABI Agriculture and Bioscience, 2023.

Figure 3: Neighbourhood area of the site. Source: Author, 2024.

Figure 4: The site. Source: Author, 2024.

THE CONCEPT:

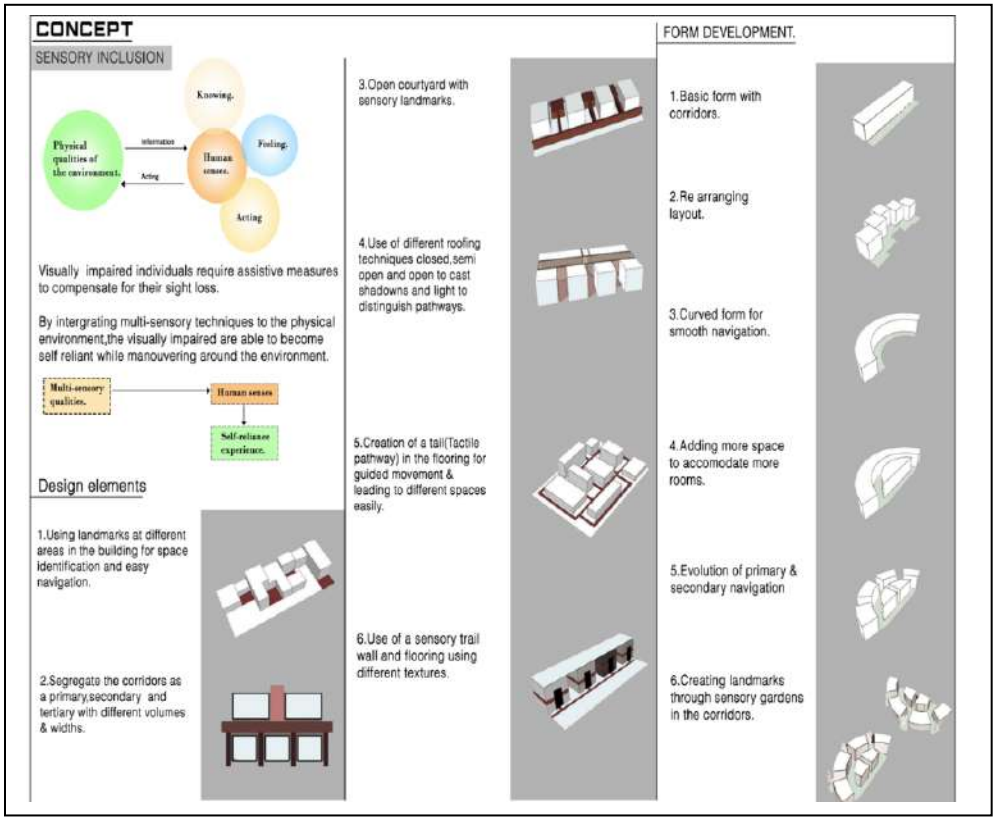

Figure 5: The concept development. Source: Author, 2024

The built environment can control one's mind and action in relation to the way it is perceived.

Through this concept a guidance trail for the blind is designed called a conscious trail which aids navigation with one's consciousness.

Their actions and behaviour are triggered through the architecture design elements and the way it is perceived.

THE DESIGN:

Project Brief

Figure 6: Exterior render of the classroom block for the school.. Source: Author, 2024.

This is a design project of a multisensory school within Thika town along workshop lane, Kiambu County on a 12-acre site. It emerges from a research thesis that explored approaches to inclusive architecture for people with visual disabilities. The design philosophy for the visually impaired is founded on principles of inclusivity, accessibility and empowerment. It encompasses universal design principles to ensure accessibility for individuals of all abilities. Further, it prioritizes the use of elements of design that relate to sensory engagement through tactile, auditory and olfactory senses of the users.

Figure 7: Exterior render of the resource center for the school. Source: Author, 2024.

Key design elements include:

1: Olfactory design: The project encompasses the use and placement of different materials that produce distinctive scents. Additionally, scented trees and plants are used in different parts of the school where they serve as navigational cues.

Figure 8: Sitting arrangement of the olfactory zone. Source: Author, 2024.

Figure 9: Multisensory garden showing different sensory trigger zones. Source: Author, 2024.

2: Haptic design: Different materials with distinctive surface textures are placed both as a floor finish and wall finish. At each circulation junction, there's a difference in floor finish which signals an option of change in direction. Additionally, tactile pathways are used on the buildings blocks to guide the visually impaired around the different spaces with little to no help. The use of a sensory trail wall together with braille signage are evident on the design as they provide additional navigation for the visually impaired.

Figure 10: Shows the placement of braille signage along sensory trail wall . Source: Author, 2024.

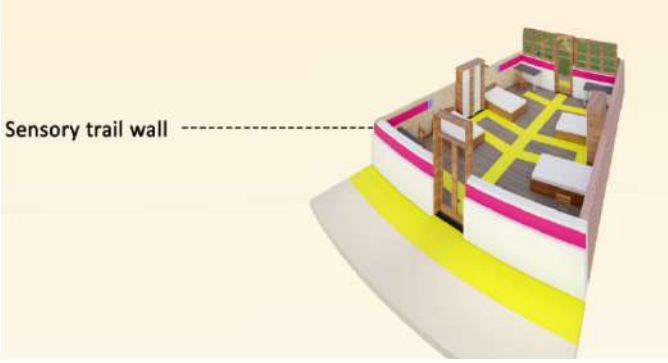

Figure 11: Shows the placement of sensory trail wall along the dormitory's corridor. Source: Author, 2024.

Figure 12: Difference in surface texture. Source: Author, 2024.

3: Auditory space design: The design proposes the use of materials, volumes of spaces and water features to produce distinctive sounds that assist in placemaking.

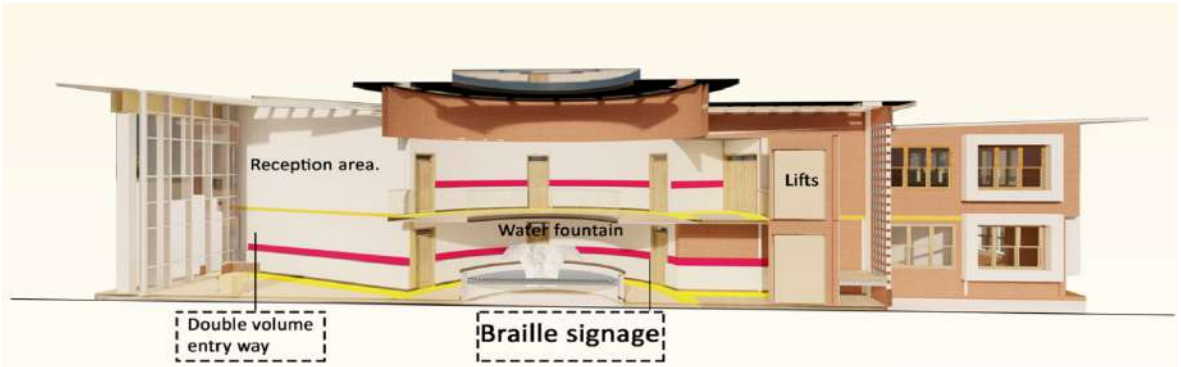

Figure 13: Auditory space design. Source: Author, 2024.

Figure 14: A double ceiling entryway as a trigger for an auditory space. Source: Author, 2024.

Figure 15: An atrium space as a trigger for an auditory space.. Source: Author, 2024.

4: Visual differentiation: Colour contrast is evident in the school's design by the use of light and dark colours. These provide ease of visibility between different elements for the low visually impaired students.

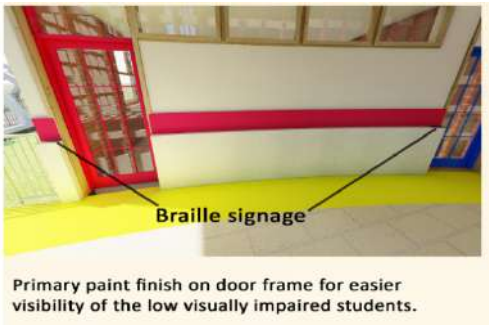

Figure 16: Difference in paint finishes to assist in visual differentiation. Source: Author, 2024.

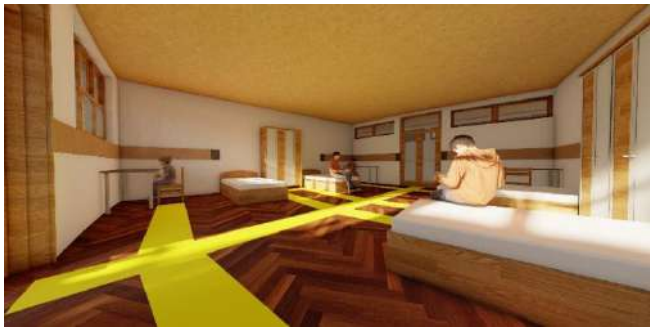

Figure 17: A tactile pathway with a difference in colour contrast. Source: Author, 2024.

5: Safety: Efficient circulation space, immovable furniture, use of balusters and fire safety techniques are all design features used to ensure utmost safety for the visually impaired students here.

Figure 18: Use of balusters as a safety feature. Source: Author, 2024.

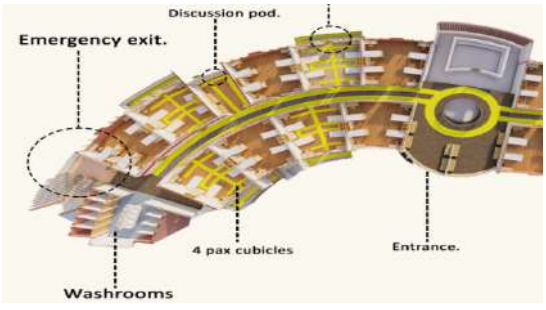

Figure 19: Dormitory floor plan illustrating the different space layouts . Source: Author, 2024.

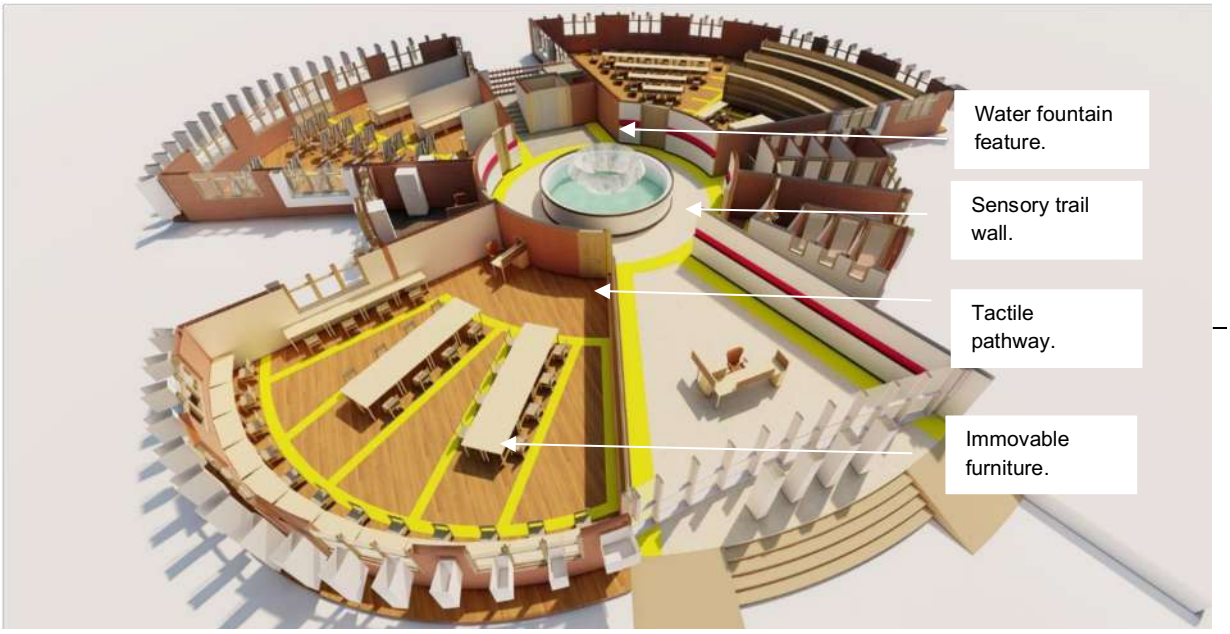

Figure 20: Orthographic view of the resource centre illustrating the different design elements used to assist the visually impaired student. Source: Author, 2024.

Sustainable Development Goal (SDG) 08

Decent work and economic growth

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Theme:

Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro small - and medium-sized enterprises, including through access to financial services.

Agenda 2063 Goal 04

Transformed Economies

Economic diversification and resilience

Theme:

Science Technology & Innovation (STI) driven Manufacturing, Industrialisation, and Value addition.

IMPACT OF ARCHITECTURAL DESIGN ON USER EXPERIENCE IN MALLS.

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SDG 8: Decent Work and Economic Growth/**A-2063**: A high standard of living, quality of life and well-being for all citizens.

SDG 8 Theme: Promote sustained, inclusive and sustainable economic growth, full and 77productive employment and decent work for all/**A-2063:** Sustainable and inclusive economic growth.

Sub-theme: Infrastructure development and environmental sustainability.

Alignment to Vision 2030: Inquiry here is premised on an intensified application of Science, Technology, and innovation (STI). This is foundation is contrived to increase productivity and efficiencyacross all three pillars (economy, society & governance – politics) of Kenya's vision 2030. The social pillar of Kenya's Vision 2030 has particular relevance here in its interest to achieve a just and cohesive society, with equitable social development and in a clean and secure environment. The study finds sympathy with the specific strategy 4 on environment highlights the desire to achieve a clean secure and sustainable environment; and the specific strategy 5 on housing and urbanisation accords priority to the strife for adequate, decent and high-quality urban livelihoods.

Alignment to NACRA: Research here also embraces research in the specific technical disciplines of the National Construction Research Agenda (NACRA) of (1) construction technology and materials; and (5)Environment.

BIOGRAPHY:

Evans is a graduate architect of the Department of Architecture and Interior Design (DAID) at Kenyatta University. He has worked at Colonnades Consultants, where he undertook diverse projects spanning residential, commercial, and industrial sectors. This enabled him to learn and advance a broad range of design skills. He further expanded his expertise at Quebar City Consultants, gaining valuable on-site construction skills and developing a strong passion for hands-on work**.** He has an interest in advocating for efficient, environmentally conscious and functional design practices for present and future generations.

ABSTRACT:

The proliferation of high-end shopping malls in Kenya has transformed urban and consumer dynamics, impacting daily life and the socio-economic landscape. Despite their importance, comprehensive empirical research on how architectural design specifically affects user experiences in these malls was lacking. This research aimed to fill this gap by exploring the precise impact of architectural design on user experiences and providing guidance for future development aimed at better serving diverse clientele. The study therefore explored the connection between architectural design and user behaviour. Emphasis was made on the role of design principles in shaping visitor engagement. Elements such as spatial layout, navigation, aesthetics, lighting, acoustics, and demographic considerations were analysed to understand their influence on overall user satisfaction. The study employed a complex or mixed research methodology, that blended qualitative and quantitative research approaches. It embraced the environmental behaviour and survey research methodologies. These were distilled for field access using observation of behaviour and case study methods. The techniques of secret outsider in observation, focus group and individual respondent interviews were put to use in this inquiry. Questionnaires and structured interview schedules were applied to obtain effective field access and to gather credible data. A judgmental sampling of two Kenyan shopping malls, the Hub in Karen and Village market at Gigiri was adopted in order to help in-depth probing of didactive environments that were rich with information. By assessing the effectiveness of various design interventions (wayfinding and signage, natural lighting and acoustics, aesthetics, store clustering and zoning) successful strategies to enhance the user experience were identified (large open atriums, incorporation of greenery and communal seating areas) and areas needing improvement (proper signage, store clustering, respite seating along corridors, artificial lighting) were highlighted. Insights (user demographic and preferences, cultural influences, e-commerce) from this analysis deepened the understanding of architectural factors (lighting, acoustics, aesthetics) affecting user experiences of malls. This offered practical recommendations for designs of shopping malls (family friendly zones, interactive displays, clear and visible signage, respite areas along long corridors). This study underscores the importance of user-centric architectural approaches in creating vibrant and successful commercial spaces, bridging theoretical design principles with practical applications.

KEYWORDS: Shopping malls, user experience, Architectural design principles.

DESIGN PROJECT DESCRIPTION: SHOPPING MALL INSPIRED BY USER EXPERIENCE IN KISERIAN, KAJIADO COUNTY.

DESIGN BRIEF:

In the dynamic landscape of retail development, the project promoted favourable user experience in shopping malls. The project considered aspects such as store accessibility and placement, wayfinding, natural lighting, targeted user demographics, and aesthetic design elements. By leveraging these principles, the project aimed at enhancing the shopping experience, ensuring seamless navigation,

Figure 1: Perspectives of the proposed shopping mall. Source: Author, 2024.

enhanced customer satisfaction and a compelling ambiance that encourages prolonged visits and repeat patronage. At its core, this project sought to set a new standard in retail architecture within Kajiado County, offering a modern, user-centric environment that caters to diverse consumer needs. By prioritizing user experience through thoughtful design, the mall aspired to foster a vibrant commercial hub that not only attracted top-tier retailers but also one that enhanced the local economy.

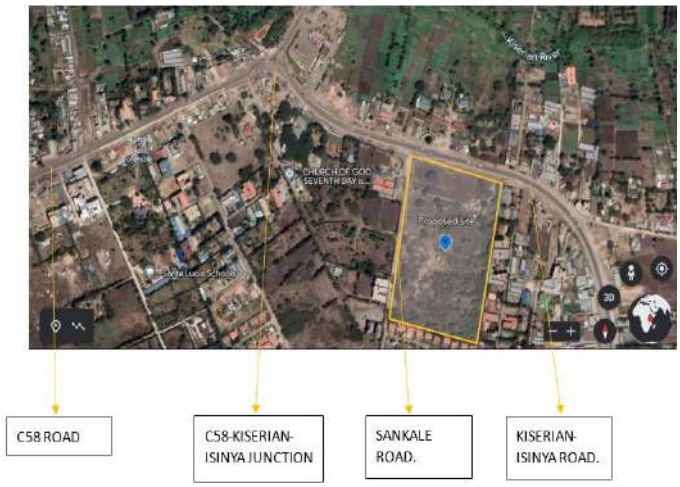

Figure 2: Site location (Highlighted). Source: Google earth, https://earth.google.com/web/@-1.44056437,36.68796372,1826.38298242a,1695.12005893d,35y,-0h,0t,0r/data=CgRCAggBOgMKATBKDQj8BEAA. 10/7/2024.

THE SITE

The site is located in Kiserian along the Kiserian-Isinya road, 25 kilometres southwest of Nairobi. It is in close proximity to Ngong (7kilometres) and Matasia (4 kilometres). The site is 290 meters from the Kiserian-C58-Isinya junction and measures 40,792 square meters (10.08 acres).

The site's location near the road junction provides excellent accessibility and visibility, which supports a strong potential customer base due to the high traffic flow and public transport connectivity.

The area presents less competition for Mall investors, as there are no other malls in the vicinity, and is strategically positioned to serve residents of both Kiserian and Isinya.

THE CONCEPT:

The concept of interaction was chosen for the design as it is a key determinant of how users perceive and value their time in the mall. Interaction influences whether users see the mall as merely a place to shop or as a community destination for socializing, relaxing and entertainment. It includes both physical activities like navigating pathways and using amenities as well as social experiences, such as meeting friends or attending events.

Figure 3 left: Natural lighting, seating areas; Figure 4 right: Focal point and aesthetic function to the atrium.

Design choices made to facilitate interaction such as wayfinding strategies, lighting, aesthetics play a significant role in shaping how users perceive the mall environment. Thoughtful spatial arrangements, visual cues, and well-placed activity nodes foster such interactions, transforming the mall from a purely commercial setting to

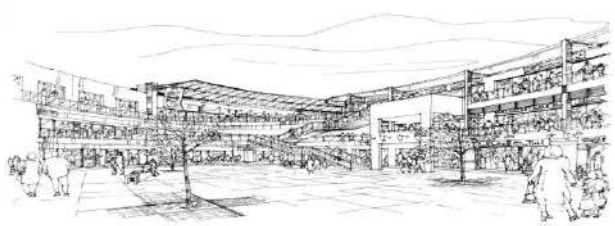

Figure 5 top: Open plaza design; Figure 6 bottom: Greenery and water features. Both instances encourage positive perception of spaces. Source: Whole building design guide, 2022.

a vibrant social hub. Elements like open plazas, seating areas and entertainment zones encourage users to stay longer and interact more, enhancing their overall experience.

Effective interaction design can lead to increased satisfaction, return visits, and a sense of community, demonstrating the power of architectural decisions in shaping user behaviour and experiences.

THE DESIGN :

Spatial Layout and Wayfinding aspects of design:

The spatial layout and navigation elements included store accessibility and placement, wayfinding, store clustering, and zoning. User demographics was also crucial in understanding where and what stores complement each other from the perspective users. In the mall, the ground floor was dedicated to high-traffic stores, ensuring prominent visibility and easy access for shoppers. Meanwhile, the first floor was tailored for children and families while the second floor took up an entertainment-orientation. It catered to different age groups.

Figure 7: Perspectives of the proposed shopping mall. Source: Author, 2024.

Wayfinding throughout the mall was achieved through the use of different floor finishes in different sections of the mall.

The central atrium present also acted as a reference point for different sections of the mall. Store clustering and zoning further enhanced the shopping experience by grouping related stores and amenities together for easier location. The ground floor was designed to house stores that benefit from high foot traffic. This afforded the shoppers maximum visibility and accessibility. Included therefore was a variety of retail options such as clothing, perfume, and watch stores. The entrance was open and inviting, creating a welcoming atmosphere with a central atrium space that included comfortable seating.

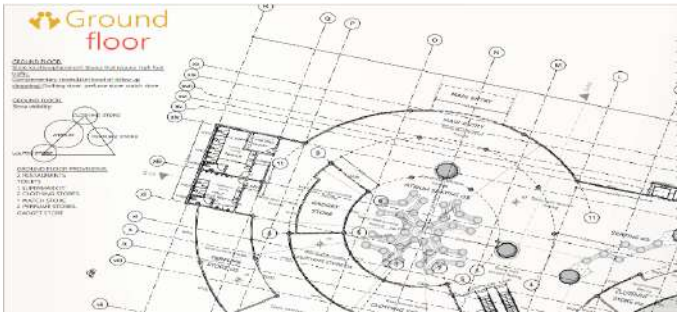

Figure 8: *Section of ground floor plan highlighting the entry section and atrium.. Source: Author, 2024.*

Figure 9: P*erspective of atrium section with seating. Source: Author, 2024.*

offering a range of entertainment and fun stores. This includes a bowling alley, indoor skating rink, and a gym, providing diverse activities to attract a wide audience. The layout ensures that these attractions are easily accessible through well-positioned lifts, stairs, and escalators that accommodating high foot traffic efficiently.

Figure 11: *Perspective of restaurant seating. Source: Author, 2024.*

The first floor is tailored for children and their parents, featuring an indoor play area, candy stores, and toy stores. This design ensures that families have convenient access to entertainment and shopping in one location. Stores are strategically placed to encourage follow-up shopping. This enhances the customer experience while increasing dwell time.

The second floor caters to all age groups,

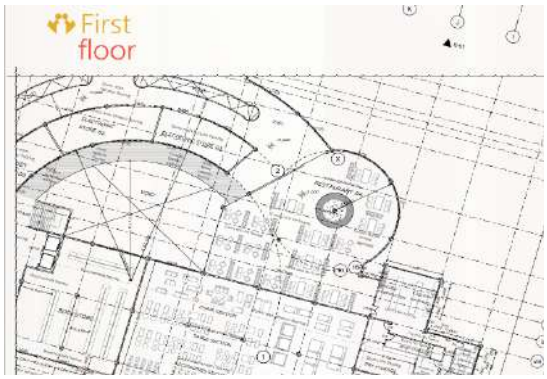

Figure 10: *Section of first floor plan highlighting different store locations. Source: Author, 2024.*

Lighting and aesthetics aspects of design. play a pivotal role, hence, to create a bright and inviting atmosphere, the mall incorporates use of ample natural light. Large windows, a central atrium and glass facades are strategically designed to maximize the flow of natural light throughout the building, enhancing the shopping experience and promoting a sense of openness and connection to the outside environment.

Key amenities within the mall include:

- **Flagship Anchor Store:** Anchoring the retail experience and drawing significant foot traffic.
- **Variety of Retail Spaces and Dining Options:** Catering to different tastes and preferences.
- **Entertainment Options:** Including a cinema and gaming arcade, providing opportunities for recreation and social engagement.
- **Seating Areas and Children's Play Zones:** Strategically integrated to promote a family-friendly environment, encouraging longer visits.

- **Respite Areas Along Expansive Corridors:** Offering moments of relaxation and reflection, enhancing the overall visitor experience.

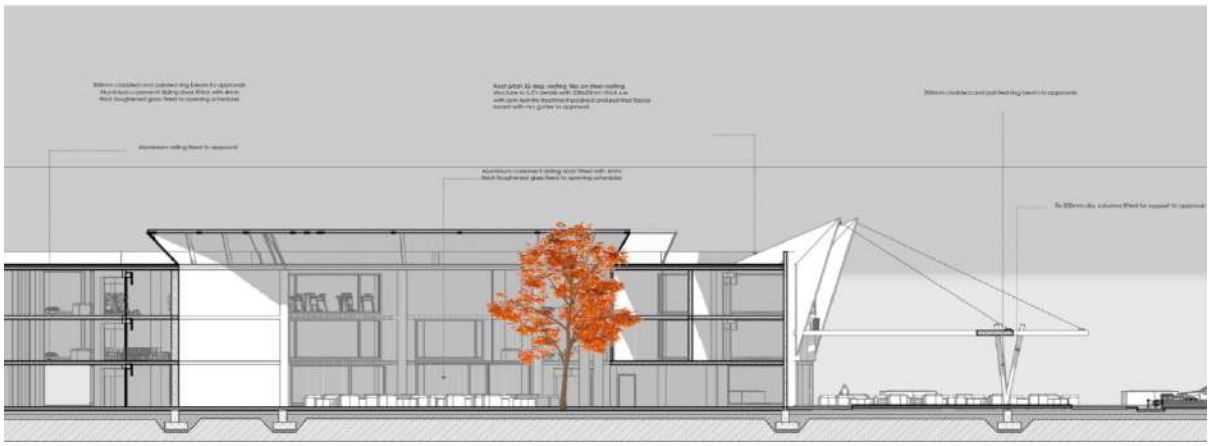

Figure 12 : Section highlighting main entry (far right) and atrium section with seating (middle section and highlighted). Source: Author, 2024.

The proposed project aimed to represent a forward-looking approach to urban development in Kajiado County, aligning with principles of sustainable design and enriching the local socio-economic landscape.

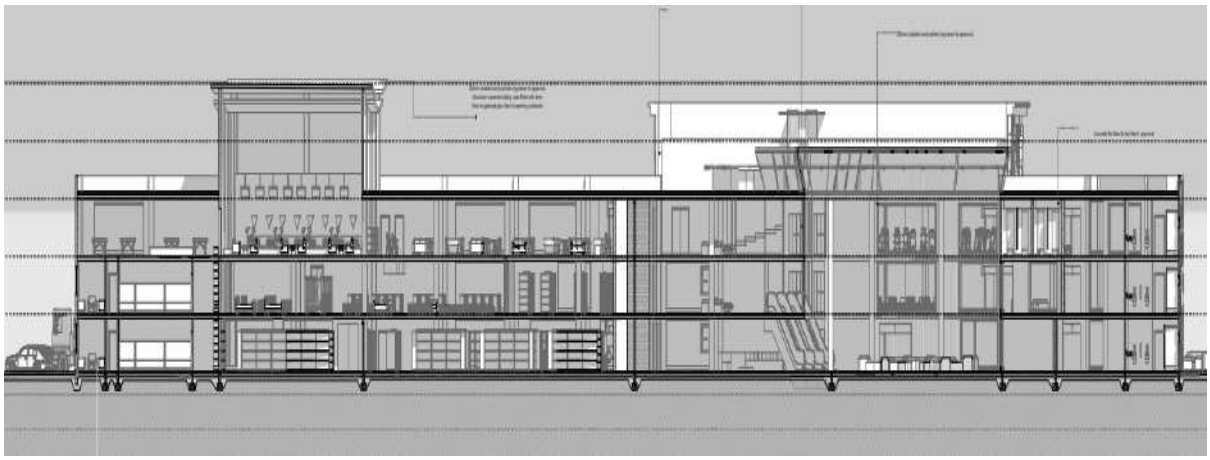

Figure 13: Section highlighting different sections of the proposed mall. Source: Author, 2024.

Sustainable Development Goal (SDG) 09

Industry, Innovation, and Infrastructure

Build Sufficient Resilient Modern infrastructure, Promote Sustainable Industrialisation and Foster Innovation without damaging the Environment and its Biodiversity.

Theme:

1. Facilitate Sustainable Resilient Infrastructure Development.

Agenda 2063 Goal 04

Transformed Economies

Theme:

Science Technology & Innovation (STI) driven Manufacturing, Industrialisation, and Value addition.

AI INFLUENCE ON THE ARCHITECTURAL DESIGN PROCESS AND PRODUCT.

Researcher: Esthlynn Nduta Okhabi, B Arch. Studies Hons, 2023/4, KU, eokhabi@gmail.com

Supervisor: Arch Moses K. Gathua, Director in charge-Anwani Architects gathua.moses@ku.ac.ke

SDG 9: Industry, Innovation and Infrastructure /**A-2063 G10**: World class infrastructure criss-crosses Africa

SDG 9 Theme: Foster Innovation/ **A-2063 G10 Theme:** Communications and infrastructure connectivity

Sub Theme: Sustainable Development through Technological Innovation

Alignment to Vision 2030: Inquiry embraces an intensified application of Science, Technology, and Innovation (STI) as encapsulated in the foundation 3.6 of Kenya's Vision 2030. AI can optimize building performance, predict structural issues, and automate repetitive tasks, allowing architects to focus on creative solutions.

Alignment to NACRA: Research aligns by supporting research in the specific technical disciplines in the disciplines 1 on Construction Technology and Materials and 5 on Environment Issues of the National Construction Authority Research Agenda (NaCRA). Of particular relevance here is the research area 1 on Digitization and Automation of Construction in Kenya. All three objectives of this research area are appropriate. These are objectives "a" that is keen to review the impact of ICT application on construction, "b" that seeks to enhance productivity and efficiency by leveraging on ICT programmes and platforms, and finally "c" with the explicit desire to assess barriers to digitization and automation programmes on construction projects complete with appropriate remedial strategies.

BIOGRAPHY:

Esthlynn O'khabi is a graduate of architecture from Department of Architecture and Interior Design, Kenyatta University's. She held leadership roles including those of Vice President and President of the Architecture Student Association. Her internships at DMJ Architects, EPZA Kenya, and the State Department for Public Works sharpened her skills in conceptualization, design, and visualization. Esthlynn is passionate about integrating technology into the construction industry. Currently, she is in her final year of an additional Bachelor's in Communication at Pan African Christian University. Her diverse background fuels her commitment to interdisciplinary innovation, with research interests in sustainable design and technological integration.

ABSTRACT:
The integration of Artificial Intelligence (AI) into architectural design processes has emerged as a transformative force, revolutionizing the ways in which architects conceive and create structures while simultaneously influencing the sustainability of the built environment. This research delves into the multifaceted impact of AI in creative processes of architectural design and its implications for sustainability. It seeks a thorough examination of AI applications in architectural design, an evaluation of AI's influence on sustainability in architectural projects, an exploration of ethical considerations tied to AI integration, an investigation of the societal implications, and the anticipation of future trends. Accordingly, the study employs a mixed-methods approach, combining surveys, interviews, case studies of AI-driven projects, and a comprehensive literature review. The study findings reveal that AI-driven tools enhance the creative potential of architects by generating innovative designs, optimizing spatial layouts, and streamlining the design process. Furthermore, AI contributes to sustainability by enabling efficient resource use, improving energy efficiency, and promoting environmentally conscious design practices. By fostering interdisciplinary collaboration and knowledge advancement, AI promises to shape the future of architectural design, sustainability, and the evolving intersection between technology and creativity. This research serves to guide practitioners in responsibly harnessing AI's potential while navigating these challenges. Ultimately, it offers a comprehensive view of how AI is reshaping these creative fields, spanning from the design processes and environmental considerations to ethical and societal dimensions. In this way, it contributes to a more sustainable and innovative built environment. However, ethical concerns such as data privacy and design authorship, as well as broader societal implications related to accessibility and equity, still pose significant challenges.

KEY WORDS: **Artificial Intelligence (AI), sustainability, ethical considerations.**

DESIGN PROJECT DESCRIPTION: THE PAST OF THE FUTURE - DESIGN OF A CULTURAL THEME PARK.

THE SITE:

Figure 1: Perspective view of the administration hub and craft village. Source: Author, 2024.

The project is dedicated to the conceptualization, design and realization of a cultural theme park centred on the Kenyan ethnic communities, strategically positioned within the Konza City Digital Centre Urban Park. The central objective is to encapsulate the profound cultural heritage of the Kenyan people, while concurrently integrating state of the art technologies and artificial intelligence tools into the overarching design scheme.

THE CONCEPT:

The concept of the project is to create a multifaceted cultural hub that honours the past while embracing the future. By integrating administrative functions, visitor engagement, craft preservation, historical education, culinary experiences, sports, and contemporary art, the project aims to foster a deep connection between people and their cultural heritage. It seeks to be a living testament to the enduring value of cultural heritage in a rapidly changing world.

Figure 2: Sketch of a typical Kenyan Nilotic hut. Source: Author, 2024.

Figure 3: Sketch of a typical Kenyan Bantu hut. Source: Author, 2024.

Figure 4: Sketch of a typical Kenyan Cushite hut. Source: Author, 2024.

The design was intentionally crafted to harmonize with the natural landscape, creating a seamless integration between built and natural environments. Strategically, civic buildings were included within urban parks, enhancing the communal experience by providing accessible, functional spaces amidst greenery. This thoughtful placement not only serves practical purposes but also enriches the aesthetic appeal and ecological balance of the urban area.

Figure 5: Bird's eyer view of the cultural theme park. Source: Author, 2024.

By embedding these structures within parks, the design promotes a sense of unity and sustainability, encouraging public engagement and appreciation of both architecture and nature.

THE DESIGN: To achieve this, the project is divided into the following three sections:

Figure 6: Conceptual sketches of the food court showcasing a blend with glass and bamboo inspired by swahili architecture. Source: Author, 2024.

Administrative, Visitor Centre, and Craft Village: This section serves as the heart of the project, providing essential administrative functions and welcoming visitors. The visitor centre offers comprehensive information about the facility, its significance, and offerings. The craft village is a vibrant hub where traditional artisans demonstrate and share their skills, allowing visitors to witness and participate in the creation of traditional crafts. This helps keep these art forms alive and provides artisans with a platform to sustain their livelihoods.

Figure 7: Exterior perspective view of the administration and craft village. Source: Author, 2024.

Figure 8: Interior perspective of the Craft Village. Source: Author, 2024.

Figure 9: Interior perspective view of the museum. Source: Author, 2024.

Figure 10: Interior perspective view of the museum. Source: Author, 2024.

The Museum and Food Court: The museum serves as a repository of cultural artefacts, exhibitions, and educational programmes that showcase the region's history and

cultural evolution. It is designed to engage visitors through interactive displays and immersive experiences. Adjacent to the museum, is the food court that offers a culinary journey through traditional and contemporary cuisines. This allowing visitors to experience the cultural heritage through taste. The combination aims to create a holistic experience that nourishes both the mind and the senses.

The Sports Arena and Art Gallery:

This section caters to both physical activity and artistic expression. The sports arena provides a space for traditional sports, promoting physical health and community interaction. The art gallery exhibits works from local and international artists, offering a platform for contemporary artistic expressions while connecting them to cultural themes. This dual focus encourages a balance between preserving traditions and embracing contemporary creativity.

Figure 11: Interior perspective of the art gallery. Source: Author, 2024.

INFLUENCE OF ARCHITECTURE ON USER EXPERIENCE IN AIRPORTS

Researcher: Makori Lenny, B Arch. Studies Hons, 2023/4, KU, makorilenny3@gmail.com

Supervisor: Arch Moses K. Gathua, Director in charge: Anwani Architects gathua.moses@ku.ac.ke

SDG 9: Industry, Innovation and Infrastructure /**A-2063G10:** World class infrastructure criss-crosses Africa

SDG 9 Theme: Foster Innovation/ **A-2063G10 Theme:** Communications and infrastructure connectivity

Sub Theme: Sustainable Development through Technological Innovation

Alignment to vision 2023: The inquiry provides useful knowledge to promote the economic pillar of Kenya's Vision 2030, which pillar seeks sot maintain a sustained annual economic growth of 10%. It is anchored on the foundation 3.4 on infrastructure which aspires to realise a nation that is firmly interconnected through a network of roads, railways, ports, airports, and telecommunications.

Alignment to NACRA: This inquiry blends in with Kenya's National Construction Research Agenda (NACRA) 4 on alternative and emerging technologies for construction products and its objective "c" with a concerns for life cycle costs pertaining to current, innovative and emerging materials and technologies for resilience and sustainability. Further it draws in the research agenda 23 on Emerging trends that relate to climate change resilience of green buildings and its goal "c" on level of use of renewable energy in construction processes and systems. To some extent, research agenda 34 on climate change, environmental management and sustainability of the construction industry also has value here with its goal "c" on the impact of construction on climate change and likely mitigation measures.

BIOGRAPHY:

Makori Lenny is a visionary architecture graduate from the Department of Architecture and Interior Design, Kenyatta University. He has obtained diverse experiences in Renaissance Per Salut Architects, DnD Design and Development consultants ltd, and Bomani Architects and Consultants. He is well skilled in various relevant software like Revit, ArchiCAD, SketchUp and rendering software like Enscape and VRay. Lenny has highly developed 3D modelling, drafting and rendering skills.

ABSTRACT:

Experience in a space one is in is critical and important. A lot of aspects contribute to a user's experience of spaces. The experience of users of an airport is directly proportional to the success of the airport. User experience in airports is therefore crucial and should be considered during the design. The state of the airports in Kenya is generally in bad shape. The research sought to establish on the impact of airport spaces or environments on user experience. It drew insights from an in-depth review of the international case studies of airports comprising of Incheon-South Korea, Changi-Singapore, King Abdul Aziz-Saudi Arabia, Heathrow-London and through local case studies of the JKIA, Kisumu and Wilson airports in Kenya. The research methods of content analysis and observation using pre-coded checklists was put to use here to guide tracer surveys and identify trends and patterns in space use as well as the related user preference. Performance of these spaces was evaluated on the basis of on key parameters of positive user experience that were related to architecture such as lighting, ventilation and airflow, indoor air quality, spatial layout and organization. The study established the importance of creating airport environments that prioritized accessibility, aesthetics, and sustainability to enhance the overall journey experience for travellers. It recommended an emphasis on strategies to enhance room acoustics, optimize daylight utilization, improve indoor air quality, and create more inviting spaces. These interventions would elevate the overall user experience.

DESIGN PROJECT DESCRIPTION: RE-DESIGN OF WILSON AIRPORT.

THE SITE:

Wilson Airport is located in Nairobi, Kenya. It lies approximately 4 kilometres south of the Central Business District. (CBD). Nearby suburbs include Langata, South C and Kibera. The airport sits on about 680 acres of land. The owner of the land and air space above it is the Kenya Civil Aviation Authority (KCAA) who lease out land to airlines that need to set up facilities for operation at the airport.

Figure 1: Figure 1: Map view of the Wilson Airport https://maps.app.goo.gl/ZCxnqRXuaaeUiqcq6

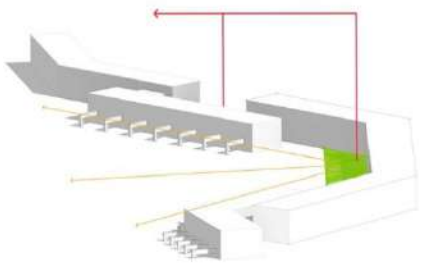

Figure 2: Massing of the various components. Showing the arrival and departure terminals. Source: Author, 2024.

THE CONCEPT:

Zenith Elysium Nexus (ZEN) is a three - word concept. Zenith means elevation or a high level above ground. Elysium means happiness. Nexus means linkage or connection of things. The design seeks to bring about this ZEN blend of an experience to users that first gives an impression of being on air the minute they arrive at the facility. Secondly its seeks integration of greenery and intricately designed interior spaces that infuses nature while at the facility, that results in an airborne museum like happy experience. The form of

structures will heavily be influenced by the general form of a stationary aircraft in order to link it with the primary functional reality causing an overall linear form with a nook at the edge or far ends.

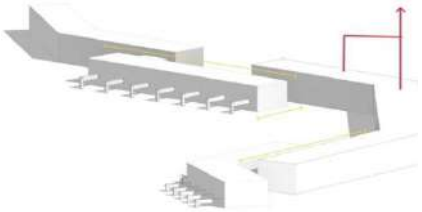

Figure 3: Massing of the various components. Showing the concourse.. Source: Author, 2024.

In line with the aspirations of Kenya's vision 2030, the project emphasizes economic growth, social development, and environmental sustainability. By incorporating state-of-the-art design and green technologies, the airport aims to become a pivotal hub for international trade and tourism, driving economic prosperity. The design prioritizes efficiency and passenger comfort, reflecting the commitment to enhance public service delivery and infrastructure development. Furthermore, the project integrates sustainable practices, including renewable energy sources and eco-friendly materials, supporting environmental conservation goals. This holistic approach ensures the airport not only meets the immediate transportation needs but that it also contributes to long-term national objectives of a prosperous, competitive, and resilient Kenya.

Figure 4: Interior perspective of indoor triple volume gardens with roof vortex. Source: Author, 2024.

Figure 5: Form Development. Source: https://www.istockphoto.com/photos/pasenger-plane-side 2024.

Figure 6: Interior perspective of luggage carousel at the baggage claim area. Source: Author, 2024.

Figure 7: Form Development. Source: https://www.istockphoto.com/photos/pasenger-plane-side 2024.

THE DESIGN:

The project mainly features an overall improvement and re-development of the Wilson airport. Some key changes made in the new design include the design of an arrival terminus building, a departure terminus building, a central/ main concourse, a parking building and newly designed hangars.

The Departure terminal serves as the exit out of the airport both for passengers boarding and getting onto their flights out of the country and passengers who are connecting flights from different destinations. The facility features key spatial provisions like waiting areas, prayer rooms, VIP lounges, restaurants and retail spaces, washrooms, breast feeding stations and many more secondary facilities.

The Arrival terminal serves as the main entry point into the airport for travellers getting into the country from various destinations. The main spatial provisions in this facility are immigration stations, luggage claim carousels, customs, waiting areas, retail stores, taxi booking facilities, washrooms and many other secondary facilities.

Figure 8: Outdoor gardens with walkways and glazed planting. Source: Author, 2024.

Figure 9: Indoor perspective of departure terminal with triple volume voids. Source: Author, 2024.

The Concourse which serves as the main central terminal connects the arrivals and departure terminals. This is the main point of entry into the airport for travellers coming in to board their flights.

Figure 10: Interior perspective of indoor triple volume garden with greenery and water features. Source: Author, 2024.

Figure 11: indoor perspective or arrival terminal. Source: Author, 2024.

Critical services provided for spatially include check-in, security checks, luggage check-in, ticketing, retail stores, restaurants, waiting and queueing areas and many other secondary facilities.

The Hangars are re-designed to provide for space where aircraft and airplane maintenance can be carried out, in a way to ensure the essential activity is not done away with after the removal of all hangar structures currently on site.

Figure 12: Bridges linking the concourse and arrival terminal over the exit vehicular access. Source: Author, 2024.

Figure 13: Hangars. Source: Author, 2024.

The project which boldly expresses a very modern and contemporary design, seeks to harmoniously blend greenery and vegetation into the design. There is a heavy presence of both indoor and outdoor landscaping in various ways, forms and design. The facility features a number of double and triple volume indoor gardens, indoor water features fused with greenery, indoor green walls and a number of double and triple volume atriums that allow for greenery to cut through the buildings floor levels.

Sustainable Development Goal (SDG) 11

Sustainable Cities and Communities

Theme:

Inclusive, safe, resilient, and sustainable cities and human settlements.

Agenda 2063 Goal 01

A high standard of living, quality of life and well-being of all citizens.

Theme:

Modern, affordable, and liveable habitats and quality basic services

THE IMPACT OF GREEN RATING SYSTEMS ON THE DESIGN OF BUILDINGS IN NAIROBI, KENYA.

Researcher: Peacejoy Kinya Mutwiri, B.Arch. Studies. Hons, 2023/2024, Kenyatta University. *mutwirikinya3@gmail.com*

Supervisor: Arch Eric Juma Ologi, Lecturer DAID Kenyatta University, *ericologi@gmail.com*

SDG 11: Sustainable Cities and Communities/**A-2063 G1**: A high standard of living, quality of life and well- being for all citizens.

SDG11 Theme: Inclusive, safe, resilient, and sustainable cities and human settlements/**A-2063 G1 Theme**: Modern, affordable, and liveable habitats and quality basic services.

Sub-theme: Habitable working environments in urban areas.

Alignment to Vision 2030: The research aligns with the economic, social and political pillars of Vision 2030 that are meant to produce a safe and sustainable environment for its citizens. Building construction have been associated with health-related issues such as sick-building syndrome and other multiple chemical sensitivities related to convectional buildings which are overlooked. To address this international issue, a lot of institutions and countries have introduced building certification systems, which are being used to investigate the consumption of energy and other resources right from the planning stage to the demolition using the life cycle analysis. The intention therefore is to secure a better future for the people of Kenya through the social pillar that seeks a just and cohesive society enjoying equitable social development in a cleans and secure environment and its social strategy that aims to invest in the people of Kenya. Goals 5.4 of this strategy that pursues a clean secure and sustainable environment and 5.5 that is concerned with providing adequate, decent and high- quality urban livelihoods are pertinent here.

Alignment to NACRA: The study embraces the specific National Construction Research Agenda (NACRA) 4 on the use of alternative and emerging technologies for construction products and is goal "c" on life cycle costs pertaining to current, innovative and emerging materials and technologies for resilience and sustainability. Further the inquiry affiliates to the research agenda 23 on emerging trends that relate to climate change resilience of green buildings and its goal "a" on the level of awareness and challenges in adoption of climate change resilience technologies of

green buildings, and goal "c" on that aims to ascertain the level of use of renewable energy in construction processes and systems. Research agenda 34 on climate change, environmental management and sustainability of the construction industry and its goal "a" with an interest in the impact of construction in Kenya on climate change and possible mitigation measures also bears relevance here.

BIOGRAPHY:

Peacejoy is a graduate architect of the Department of Architecture and Design (DAID), Kenyatta University. She did her industrial attachment at the Kenya Wildlife Service and thereafter subsequently at A-scape Studio Limited. Further, she has participated in a community development programme in partnership with Architects Without Borders from Denmark and Art of Music to create a safe, safe, healthy, and creative space for users at the St. John Community and the larger Korogocho area. Peacejoy delights in modelling, art, nature, interior design and creating spaces that promote a sustainable future.

ABSTRACT:

This study investigated the transformative influence of green rating systems on the design practices and outcomes of buildings in Nairobi, Kenya. It also probed the limitations and challenges that influenced the incorporation of green rating systems here in Nairobi, Kenya. With the global imperative for sustainable development and the increasing environmental challenges faced by urban areas, the adoption of green buildings has become essential. The study employed a comprehensive methodology, combining literature review, case studies, self-administered and guided interviews with architects, building managers, consultants and developers involved in the design of certified green buildings in Nairobi. The researcher explored motivation, challenges and success factors influencing the incorporation of green rating systems on the design of buildings in Nairobi's architectural landscape. The study focused on LEED and EDGE as they have been widely used in Kenya. Two buildings, Britam Tower and Vienna Court were selected as case studies in order to derive valuable insights. It emerged that EDGE was the most widely used green rating system in Kenya. Building with certification in mind made the interventions more comprehensive. It was more cost friendly compared to applying for certification after the design. The cost of certification was the most popular factor that influenced the choice of green rating systems. It was recommended that, the development of financial incentives or subsidies for developers could help offset initial implementation costs and encourage more widespread adoption of sustainable design.

KEY WORDS: **Green rating systems, green buildings, certification.**

DESIGN PROJECT DESCRIPTION: A REGIONAL CLIMATE CHANGE RESOURCE CENTRE.

THE SITE:

The site is located in Rosslyn area, along Redhill Road, Westlands Constituency, Nairobi, Kenya. Rosslyn is a suburb in the northern part of Nairobi City County, at the border of Nairobi and Kiambu Counties.

Figure 1: Aerial image of the site. Source: google map; Author, 2024.

Specifically, Rosslyn is situated to the northeast of Nyari, and west of Runda, 3 km east of Gachie, approximately 9 km from the city of Nairobi County. The client of this project is the United Nations in collaboration with the Government of Kenya.

THE DESIGN:

This facility is a green building that integrates sustainable design practices by setting an example of a building with green rating certification. With the emerging trend of climate change in Kenya, this resource centre sensitizes people on issues of climate change as it serves as an example of a green buildings through these practices. The facility not only offers training on climate change responses, but also offers accommodation to the people who attend the training while also offering relaxation facilities such as gym, spa and swimming pool. The building consists of the following four zones that make up the entire facility, administration, restaurant, a conference facility and the boutique hotel.

Figure 2: Perspective view from the parking lot. Source: Author, 2024.

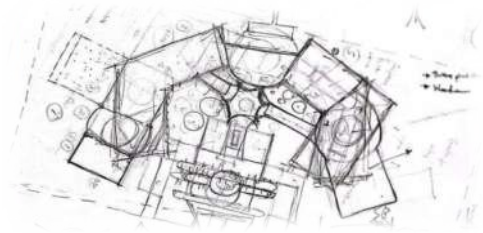

Figure 3: Superimposed elements of design. Source: Author, 2024.

THE CONCEPT:

This facility was driven by the concept of green buildings which refers to a building that is able to integrate principles of sustainable design with the aim of achieving rating. The green building concept aims to achieve attributes such as indoor environmental quality, energy efficiency, water efficiency, use of sustainable materials, pollution & waste reduction, site optimization and design innovation. The elements of scheme design adopted include space, variety, axis and dominance.

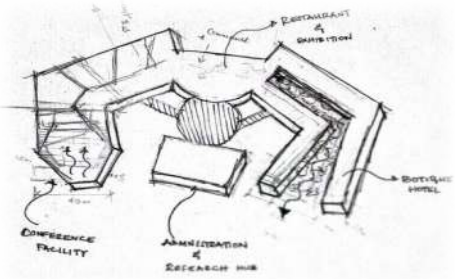

Figure 4: Superimposed elements of design. Source: Author, 2024.

Strategies achieved:

The following strategies were achieved: Use of courtyards, adopting green roofs, use of LED motion-sensor lighting,

Figure 5: Aerial view of the scheme. Source: Author, 2024.

provision of sun-shading elements, use of solar panels and solar active facades, use of glass facades, provision of sustainable modes of transport, rain-water harvesting through landscaping and building form, water-recycling within the site, use of dual-flush water systems, use of sustainable materials such as wood, terracotta tiles, natural stone, curtain walling, use solar panelled pedestrian canopies, adopting green spaces, use of green walls and adopting landscaping elements such as water fountains and water ponds.

INFLUENCE OF DESIGN ON THE ADAPTABILITY OF BUILDINGS: A Case of the City of Nairobi, Kenya.

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Supervisor: Paul Mwangi Maringa (PhD), CBS, FAAK, MKIP, Adjunct Professor of Architecture & Planning, DAID, SEA, KU, pmmaringa2013@gmail.com

SDG 11: Sustainable Cities and Communities/**A-2063 G1:** A high standard of living, quality of life and well-being forall citizens.

SDG11 Theme: Inclusive, safe, resilient, and sustainable cities and human settlements/**A-2063 G1 Theme:** Modern,affordable, and liveable habitats and quality basic services.

Sub-theme: Urban Regeneration of Public CivicBuildings.

Alignment to Vision 2030: Inquiry here is premised on an intensified application of Science, Technology, and innovation (STI). This is foundation is contrived to increase productivity and efficiencyacross all three pillars (economy, society & governance – politics) of Kenya's vision 2030. Specific focusis brought to bear here on the social pillar of Kenya's Vision 2030. This pillar aspires for a just and cohesive society, with equitable social development and in a clean and secure environment. This aim is addressed here through the social strategy whose intention is to invest in the people of Kenya through thetwo specific goals of (4) a clean secure and sustainable environment; and (5) adequate, decent and high-quality urban livelihoods.

Alignment to NACRA: Research here also embraces research in the specific technical disciplines of theNational Construction Research Agenda (NACRA) of (1) construction technology and materials; and (5)Environment.

BIOGRAPHY:

Michael is a graduate architect of the Department of Architecture and Design (DAID), Kenyatta University. He is a community champion for the environment with manifestly commendable academic work. His has displayed outstanding excellence in individual, group and international architectural competitions, like the Xylem Global student innovation challenge. Macharia took up critical roles at Sycum Ltd, lifestyle estates and canopy ventures. He currently serves at the Directorate of Public Works,Kiambu County office with responsibility for drafting, documenting,

and visualizations of designs in. Heis committed to advancing architectural knowledge in the built environment, particularly in sustainable architecture, and heritage conservation.

ABSTRACT:

This study investigated the design and adaptability of civic buildings considering the challenge of static architecture and resultant building obsolescence occasioned by human and environmentally induced change. Static architecture escalates the life-cycle environmental impacts on the construction industry resulting from increased resource consumption, building material production and demolition wastes. Correspondingly there is an increasing emphasis on energy-efficient structures and updating existing building stocks to meet contemporary sustainability standards. The study explored the concepts of building adaptation, adaptability, layers as a way to conceptualize the building and link time and materialform, adaptability and the imperative for sustainability, design for dis-assembly, and obsolescence. Alsoexplored were strategies on spatial organization, structural configuration and redundancy, upgradability of building services and adjustability of the building envelope, that optimize building adaptability. Selected case studies in Nairobi were probed using environmental behaviour research methods of observation and tracing effects of after use through pre-coded checklists in order to find out how the original design had affected the adaptability of each of the buildings over the years. Other buildings werereviewed through library research and analysis of archival information. A sample survey of respondent opinions was also conducted using structured interview guides, gathering information on the fundamentalaspects of building design, the forms of adaptability in the use of buildings and its' relationship to design.This research demonstrated that design choices on spatial organization (of the form of loose fit spaces ormultifunctional spaces, structural configuration, building services and building envelope) influenced adaptability of buildings.

KEY WORDS: Adaptability, redundancy, upgradability, adjustability, obsolescence.

DESIGN PROJECT DESCRIPTION: KIAMBU COUNTY HEADQUARTERS.

WHY COUNTY HEADQUARTERS?

The design of a county headquarters offers an opportunity to define the architectural language of designing such spaces as devolution is a relatively new form of governance in the country with regards to adaptability county headquarters are a democratic monument where some users of the space are elected which offers opportunities for change in use or users. This is a project to house the executive wing of the county government:

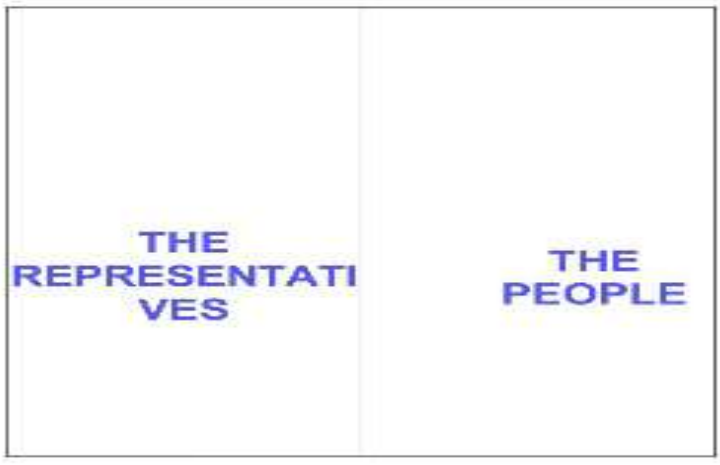


Figure 1: Abstraction of the spatial layout from the two main user groups: source author 2024.

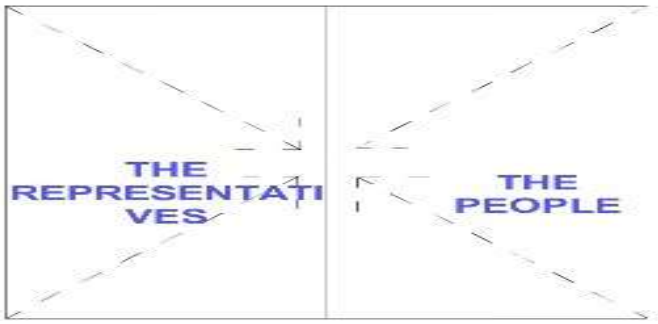
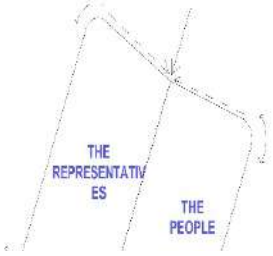


Figure 2: Abstraction of the spatial layout : source author 2024.

1.Governor
2.Deputy Governor
3.County executive committee member
4.Chief officer
5. Director
6.Deputy Director
7.Assistant Deputy Director
8.Department Officers
9.General public spaces

DESIGN CONCEPTUALISATION:

Kiambu County Headquarters as a cultural nexus: Given the diverse range of considerations for the Kiambu county government headquarters, integrating multiple concepts was essential. A holistic concept that encapsulates experiential diversity, transparency, evolving ecosystems, adaptability, kikuyu culture, and the administrative significance of the location termed as "cultural nexus".



The concept envisioned a building that can serve as a symbol of administrative efficiency, cultural pride, and community engagement. The design would reflect the diverse experiences of both the people and the representatives, emphasizing transparency, adaptability, and a strong connection to kikuyu culture in a location that serves as the heart of the administrative district.

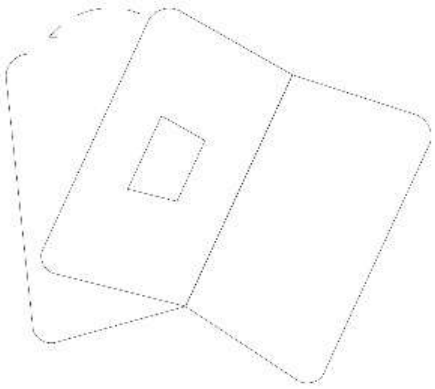


Figure 3: Planning conceptualization: source author 2024.

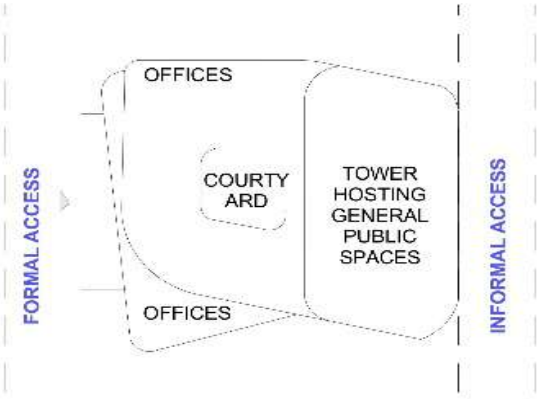


Figure 4:Planning conceptualization: source author 2024.

The central gathering point can be likened to convergence which means when two or more things come together to form a new whole the design uses this idea in planning that is symbolic of the county headquarters being a central place where people from different parts of the county converge to receive services which are not offered at the sub counties level, In addition to the outline of the plan defining its form the building also adopts the common style of most civic buildings which have a tower that is monumental and structures below it that enclose a courtyard.

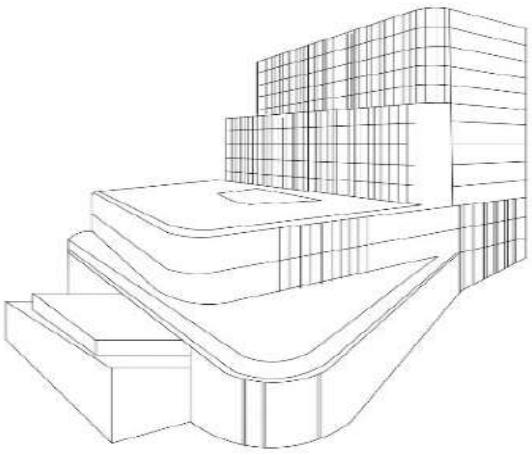


Figure 5: Form conceptualization: source author 2024.

Figure 6: Rendered image of the form, source author 2024.

The design was done around an existing building indicated by gray on the plan. As a special consideration for the different user groups the part of the structure hosting the county departments was terraced to create outdoor relaxation spaces for the county staff with the topmost part of the tower having a helipad.

Figure 7: Ground floor plan Source: author,, 2024.

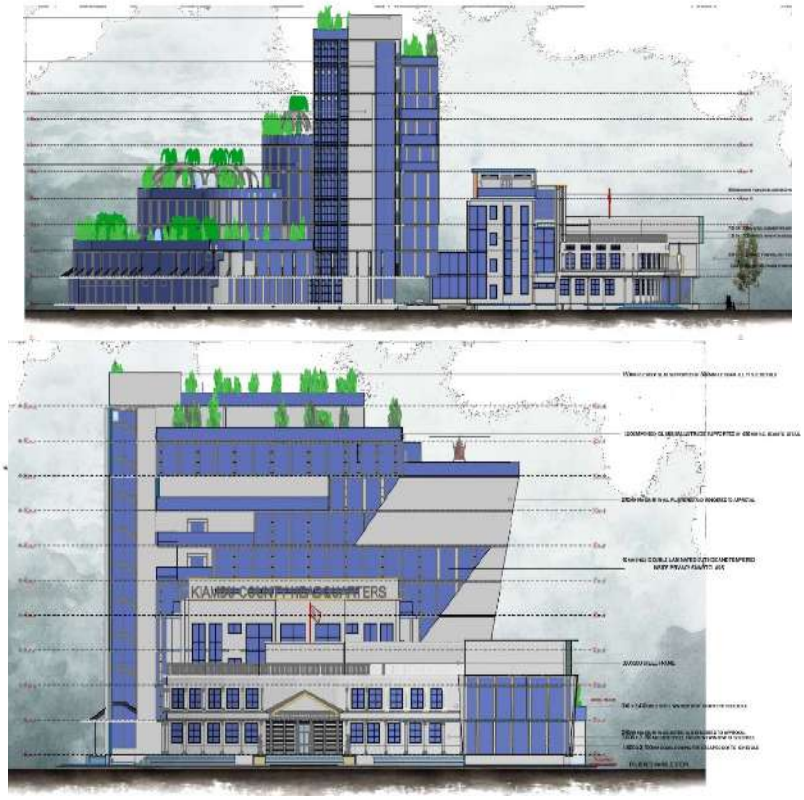


Figure 8: Side and front elevations Source: author,, 2024.

.ADAPTABILITY STRATEGIES ADOPTED INCLUDE:

1. Loose fit space: giving it ability to accommodate variations in spatial configuration.
2. Joinable/divisible space: that can accommodate varying group sizes or activities.
3. Spatial ambiguities: between interior and exterior spaces by use of glass and terraces enhancing a sense of openness and fluidity within the structure.
4. Movability of elements: such as furniture and partitions allowed for user customization.

Figure 9: View from adjacent road. Source: author, 2024.

Figure 10: Front View Source: author, 2024.

5. Multiple entry points: each serving a different purpose or user group improved accessibility and separation of various functions within the building (formal and informal entry).
6. Shallow depths through strategies like courtyards for daylighting & natural ventilation.
7. Regularly spaced structural grids: allowed for more open and uninterrupted spaces within the building .
8. Use of framed construction rather than load-bearing walls: provided more flexibility in interior layout.
9. Use of service ducts, raised floors, and dropped ceilings with access points: to facilitate easy access to building services making maintenance and upgrades easier and without significant disruption.
10. Durability of materials to ensure long life of the building.

Figure 11: Rear View from Kiambu golf course Source: author, 2024.

THE ROLE OF STADIUM DESIGN IN PROMOTING SOCIAL COHESION AND INCLUSIVITY.

Researcher: Maina Michael Muhuthia, B.Arch. Studies. Hons, 2023/4 muhumichaelthia@gmail.com

Supervisor: Arch. Moses K. Gathua, Director in Charge-Anwani Architects, Gathua.moses@ku.ac.ke

SDG 11: Sustainable Cities and Communities /A-2063 G1: A high standard of living, quality of life and well-being for all citizens.

SDG 11 Theme: Inclusive, safe, resilient, and sustainable cities and human settlements /A-2063 G1 Theme: Social security and protection, including persons with disabilities; Modern, affordable, and liveable habitats and quality basic services.

SDG Sub-Theme: Provide access to safe and inclusive green and public spaces.

Alignment to Vision 2030: This research embraces Vision 2030's foundation 3.3 that advocates for enhanced equity and wealth creation opportunities for the poor. It also resonates with the social strategy of investing in the people of Kenya, more specifically, the strategy 5.6 that seeks improved livelihoods for all vulnerable groups (gender, youth and other vulnerable groups) developing competitive and prosperous youth while opening up the country for global sports events. The inquiry conforms to the specific strategy 5.7 on equity and poverty elimination that seeks a to fashion a society that that guarantees equality of opportunity in accessing public services and providing income-generating activities as widely as possible, alongside gender parity & fairness in the delivery of justice.

Alignment to NACRA: This study relates to research agenda 19 on maintenance and functionality of construction products (infrastructure and buildings) and is goal "a" that sets out to ascertain the suitability, convenience, comfort and functionality of construction products for use especially by people with physical disabilities and the elderly.

BIOGRAPHY :

Michael is a graduate architect of the Department of Architecture and Interior Design (DAID) at Kenyatta University, and an active member of ASA-KU and AAK. Excellence gained him second runner-up status in the 2023 Crown Paints Awards. He has experience in both public and private sectors of the architectural practice, working as a mentee of the Lead Architect at Heights Building Construction Ltd on industrial attachment at the State Department for Housing and Urban Development. He is currently the Assistant Head of Department for Architecture at ORAD GROUP and founder of Mynor-Arts, an art studio specializing in artistic realism.

ABSTRACT:

Stadia should be inclusive and accessible for all, including disabled people and those with limited mobility. The stadium and its surrounding precinct should respect principles of non-discrimination, equality, dignity, inclusivity, and functionality. Stadia should be simple and intuitive to use, reducing risks and errors due to accidental or involuntary actions. This study focused on the role of stadium design in promoting social cohesion and inclusivity in Nairobi City County, a cosmopolitan area. Whereas stadia are traditionally designed for sports and entertainment, their impact on social cohesion and inclusivity often remains underexplored. This research aimed to address this gap by examining the role of stadium design in fostering social cohesion and identifying specific design principles, elements and strategies that could enhance this function. through extensive literature review and in-depth case studies. The researcher used observation and interviews to gather primary data and then followed through with qualitative analysis specifically thematic analysis to decipher spatial dispositions, and patterns of user preference and needs. The study established that there was a great need to improve stadia designs in Nairobi, Kenya, in a rapidly changing world. The findings of the study indicated that stadia should implement the seven principles of universal design, vis: equitable use, flexibility in use, simple and intuitive use, perceptible information, tolerance for error, low physical effort, size and space for approach and use of public spaces and amenities. More public space such as quiet zones, sensory rooms, lactation rooms, baby changing rooms, family spaces, and restaurants, should be included in renovation design processes for existing stadia in order to reduce the likelihood of losing out on the clientele that needs such spaces. These would include the disabled, lactating, mothers, the elderly, their friends and families.

KEY WORDS: Accessibility, Inclusivity, flexibility, intuitive use, perceptible information, disabled.

PROJECT DESCRIPTION: A MULTI-PURPOSE COMMUNITY SPORTS CENTER.

THE SITE:

The proposed site is the existing Jamhuri Sport's Center located along Ngong Road. It occupies an approximate area of 75 acres (300,000 square meters) and is bordered by the Ngong Forest to the south and the show ground to the east.

Figure 1: Project Location. Source: google earth pro https://maps.app.goo.gl/CdpPuzdsmk1yCs9D9

THE CONCEPT:

Consistent with this setting, the sports complex design exhibits a predominantly naturalistic landscape with minimal hardscape elements.

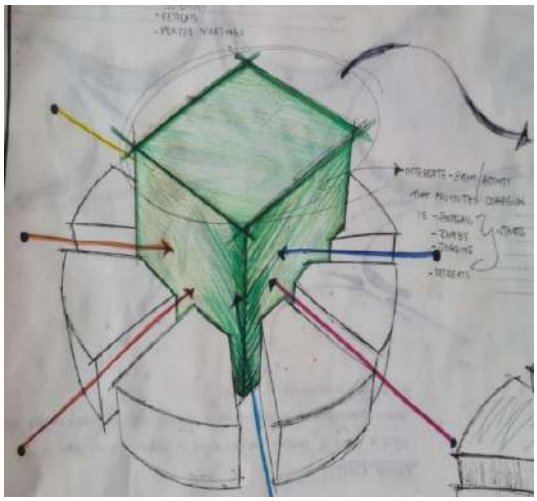


Figure 2: Inspiration from different sectors of a pie. Source: Author, 2024.

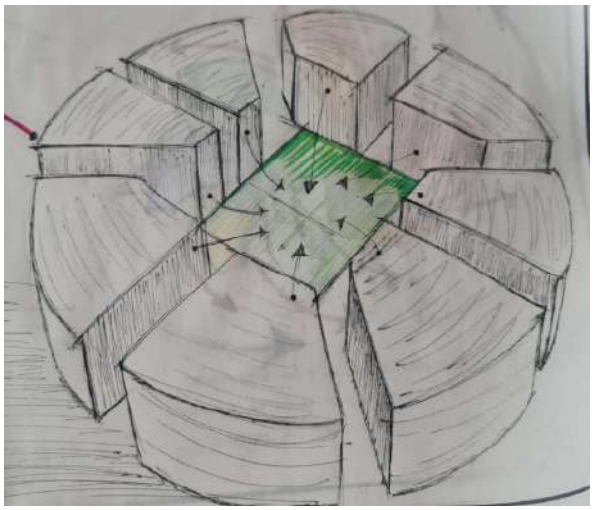


Figure 3: Inspiration from different sectors of a pie. Source: Author, 2024.

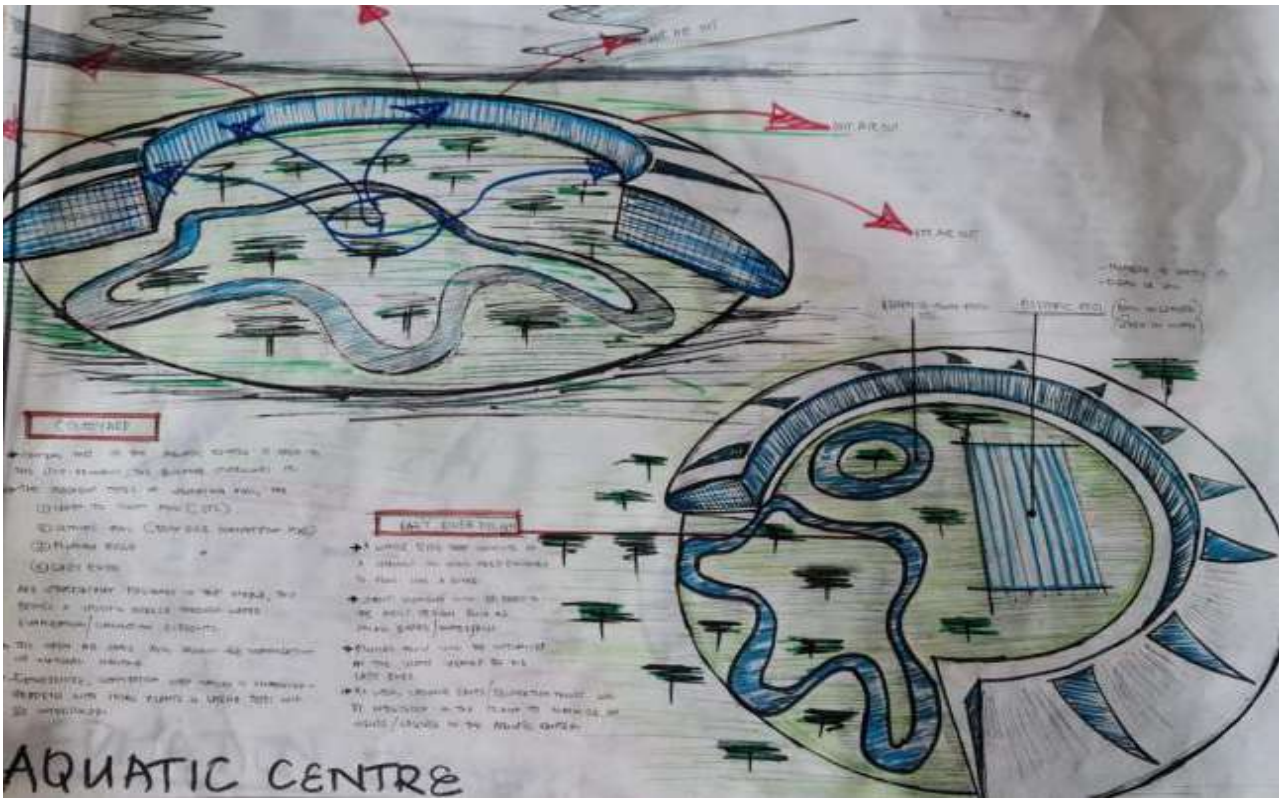


Figure 4: Image of the concept of the Aquatic and Fitness Centre. Source: Author, 2024.

THE DESIGN:

Figure 5: Image of the Aquatic and Fitness Centre. Source: Author, 2024.

The complex encompasses various amenities, including a food court, modern ablution facilities, picnic sites, jogging tracks, three football pitches, and two rugby fields. In response to a directive from the Ministry of Sports, Culture, and Heritage, a proposal was put forth to construct a stadium on the premises in preparation for the 2027 African Cup of Nations (AFCON) tournament, thus prompting the selection of this site.

The sports facility comprises three primary structures: The sports clubhouse, the aquatic Center, and the multipurpose stadium. The aquatic centre features a comprehensive swimming zone, including a toddler pool, hydrotherapy pool, leisure pool, Olympic-sized pool, and mini plunge pools. Additionally, it houses a well-equipped gymnasium on the first floor, complete with pin-loaded and cardiovascular machines, a dedicated ladies-only gym, and an aerobics zone.

The aquatic centre also uniquely incorporates a multi-faith room that can serve as a wellness room or a quiet space for contemplation, promoting inclusivity for individuals of diverse religious and non-religious

Figure 6: Image of the Aquatic and Fitness Centre. Source: Author, 2024.

backgrounds. Furthermore, a meditation pavilion is available to facilitate pursuits beyond physical fitness.

The multipurpose venue, the stadium, boasts a flexible design capable of accommodating up to 20,000 seats. Sensory rooms are designed to create a calming and soothing environment, typically featuring dim lighting, soft furnishings, and sensory-friendly decor, thereby reducing sensory overload for individuals who may become overwhelmed by the sights and sounds of a game. Nearly every restroom within the stadium is equipped with baby-changing stations, and all restrooms are accessible to Persons with Disabilities (PWDs) with the majority featuring baby-changing tables.

Figure 7: An aerial view of the proposed multi-purpose community sports Center showcasing the sports clubhouse, the aquatic Center, and the multipurpose stadium Source: Author, 2024.

The sports clubhouse incorporates a kids' zone, an arcade zone, a board games area, and a table games area. The club's board rooms and meeting rooms, located on the first floor, are accessible through ramps, which feature rest areas suitable for the elderly, young, individuals with disabilities, obese individuals, those with breathing difficulties, and the partially blind.

LIFE CYCLE ANALYSIS OF THE ENVIRONMENTAL IMPACT OF BUILDINGS IN NAIROBI CITY, KENYA

Researcher: Wamkaya Atieno, B.Arch. Studies. Hons, 2023/4, Kenyatta University, wamkaya.s@gmail.com

Supervisor: Arch. Franklin Mwango, Lecturer & Founding Chairman, Dept of Architecture & Int. Design, SEA, KU, mwango.franklin@ku.ac.ke

SDG 11: Sustainable Cities and Communities /**A-2063 G1:** A high standard of living, quality of life and well-being for all citizens.

SDG 11 Theme: Inclusive, safe, resilient, and sustain
able cities and human settlements /**A-2063 G1 Theme**: Modern, affordable, and liveable habitats and quality basic services

SDG Sub-Theme: Green buildings and infrastructure.

Alignment to Vision 2030: The inquiry emphasises embodied energy support to environmental preservation and sustainable development. Its inherent pursuit of sustainable energy and climate action by lowering the carbon footprint through energy-efficient construction practice, is in line with the second pillar of Kenya's Vision 2030. This pillar envisages a just and cohesive society that enjoys equitable social development in a clean and secure environment. It supports the social strategy of investing in the people of Kenya, more specifically the social strategy 5.4 on environment that promotes environmental conservation in order to provide better support to the economic pillar flagship projects for the purposes of achieving the Millennium Development Goals (MDGs).

Alignment to NACRA: The research advances sustainable construction techniques, which is in line with Kenya's National Construction Research Agenda (NaCRA). It satisfies NaCRA research agenda 4 that promotes the use of alternative and emerging technologies for construction products and more specifically its research objective “c” of illustrating the life cycle costs pertaining to current, innovative and emerging materials and technologies for resilience and sustainability. This objective encourages innovation and efficiency in the building industry for instance by looking into energy-efficient materials and techniques. Research agenda 23 of NaCRA ON emerging trends that relate to climate change resilience like smart cities, railway cities, university cities, green buildings and intelligent buildings also finds relevance here, more particularly in its objective “c” on To ascertain the level of use of renewable energy in construction processes and systems in Kenya. Such would come by through active stakeholder participation, helping establish best practices, and providing information for policy decisions. In the end, by lowering the carbon

footprint of building projects, this study advances NaCRA's overarching goal of raising the calibre, sustainability, and competitiveness of Kenya's construction sector.

BIOGRAPHY:

Wamkaya is a graduate architect from the Department of Architecture and Interior Design (DAID) at Kenyatta University. She has an interest in making things from scratch by hand and therefore enjoys projects that involve carpentry, sewing, crafting, and gardening. She delights in the profession of architecture as it aligns with making ideas come to life. Professionally she has worked for Renaissance per Salut Architects and is currently exploring alternative ways to practice architecture and its related disciplines outside a corporate environment. She is keen on pursuing further studies related to environmentally conscious design and building lifecycles.

ABSTRACT:

The study interrogated building lifecycle design and its influence on the environment. The exploration of building life cycle is based on breaking down a building project into the following three constituent stages: construction, operation and demolition. These stages were derived from a mathematical formula used to quantify embodied energy which is used as a measurement of how environmentally efficient a building is. The study carried out case studies on the International Centre for the Red Cross (ICRC), in Spring Valley, and Deloitte Building along Waiyaki Way, in Nairobi City County. Resident architects and engineers were interviewed to determine the values required for the various parameters in the formula. Theoretical case studies was also carried out and inference made on the ideal approach to designing for an effective building lifecycle. It emerged that the three stages, construction, operation and demolition were fully intertwined for a successful design that respected lifecycle consciousness to result. In such a case, construction was to be done with locally available, easy to process materials obtaining from nature. Additionally, they needed to be recyclable for the eventual fate of a building at the end of its life cycle. It was necessary that construction technology be simple. The overall design need to also respect the environment and use elements and processes in nature in order to reduce embodied energy. Further, the building services were to be designed intelligently to reduce reliance on mechanisation and embrace renewable sources of energy. By design resources such as water were to be used effectively and recycled as well.

KEY WORDS: **Embodied Energy, Environment, Sustainability.**

DESIGN PROJECT DESCRIPTION: OFFICE BLOCK FOR THE ENVIRONMENTAL NON-PROFIT DELTERRA.

THE CONCEPT:

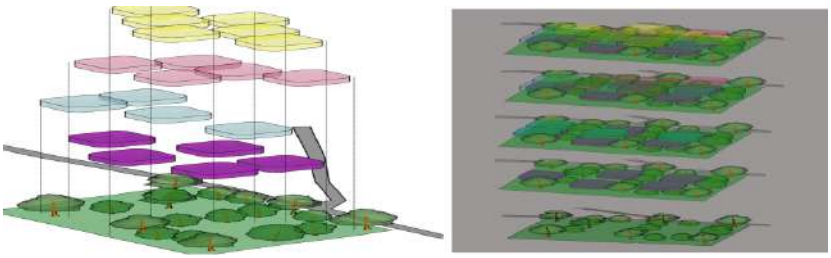


Figure 1: Project modularisation and massing on site. Source: Author, 2024

The project concept focused on elements of sustainability and renewability. The philosophy for the project was to touch the earth lightly and the design concept was ouroboros, a

Greek philosophy symbolising the eternal cyclic renewal or cycle of life, death, and rebirth or renewal. It influenced design in terms of approach to the site, building systems, material choice and overall design aesthetics.

THE SITE:

The proposed project is located in Upper Hill, Nairobi along Mawensi road. The site topography and vegetation influenced the spatial distribution and the building footprint.

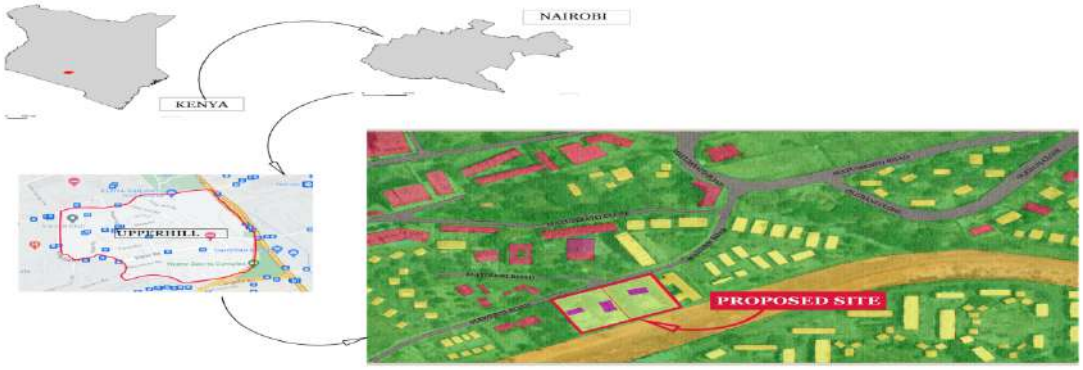


Figure 2: Site context and location. Source: Author, 2024

THE DESIGN:

The proposed project was and office block for the environmental non-profit Delterra organisation. The offices included facilities such as education workshops, resource areas and administrative spaces. The project is also meant to illustrate that a building can be aesthetically pleasing, environmentally friendly and fully functional. Additionally, the approach to designing the offices was ordered to embrace user functional and health needs. The design then encouraged users to use public transport, non-motorised transport. It uniquely gave priority to non-mechanised circulation.

Figure 3:General impression of the buildings.. Source: Author, 2024.

The project's harmony with the environment also illustrated the possibility and importance of integrating the natural environment with built structures.

Seeing the project as foreign entity on site is also a statement on the perpetuity of nature vs the fleeting nature and life cycle of buildings. The building placement on site was done with respect to the topography and the vegetation. The building was conceptualised as being situated in the spaces left by vegetation.

Consideration was given to ensuring existing trees on site would not be disrupted or uprooted.

The building lowers its embodied energy in several ways which was the primary measure used to determine how environmentally impactful it is. Every decision from the conceptualisation of spaces as modular, a separate structural system, use of renewable energy sources and simple construction connections all contribute towards a low embodied energy.

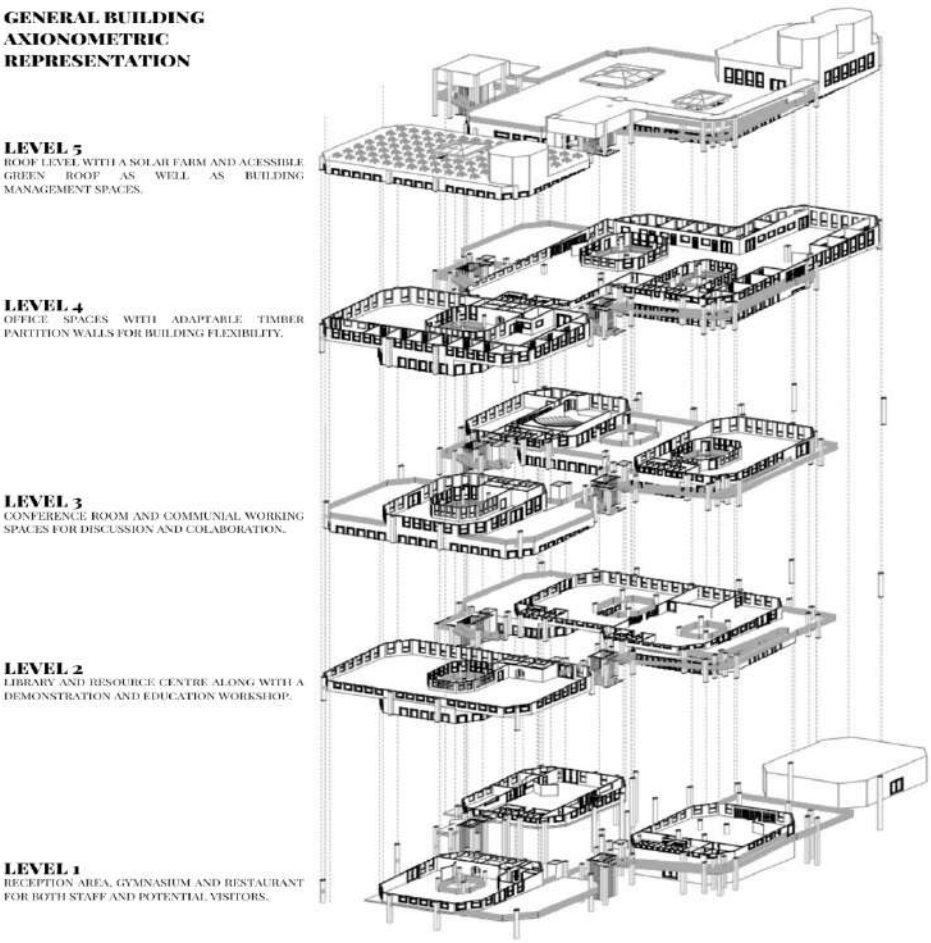


Figure 4: Axonometric building view: Source, Author: 2024.

ANALYSIS OF THE RELATIONSHIP BETWEEN DESIGN AND IEQ OF BIOMEDICAL RESEARCH FACILITIES: THERMAL AND VISUAL COMFORT

Researcher: Linda Wamuyu Murage, B.Arch. Studies. Hons, DAID, SEA, KU, a.wamuyumurage@gmail.com

Supervisor: Mary Wairimu Maina (PhD), Lecturer, DAID, SEA, KU, maina.wairimu@ku.ac.ke

SDG 11: Sustainable Cities and Communities/**A-2063 G1:** A high standard of living, quality of life and wellbeing for all citizens.

SDG Theme: Make cities and human settlements inclusive, safe, resilient, and sustainable/**A-2063 G1 Theme:** Modern, affordable, and liveable habitats and quality basic services.

Sub Theme: Green Buildings and Infrastructure

Alignment to Vision 2030: Under the overarching vision of making Kenya a globally competitive and prosperous nation with a high quality of life by 2030, this research is anchored on the social pillar of Kenya's Vision 2030. This pillar seeks to achieve a just and cohesive society enjoying equitable social development in a clean and sur environment. The policies under this social pillar are informed by foundation 3.6 on Science, Technology and Innovation (STI) for effective implementation. This foundation recognizes the critical role played by Research and Development (R&D) in accelerating economic development in Kenya. This research contributes to social strategy 5.2, that addresses the Health Sector. It aligns to the contemporary inclination to shift the bias of the national health bill from curative to preventive care approach. Kenya intends to become the regional provider of choice for highly specialized health care, thus opening up Kenya to "health tourism" as an income-generating activity.

Alignment to NACRA: The research embraces research on the specific technical discipline number 5 of National Construction Research Agenda (NACRA) on Environmental Issues with a focus on research area 23 that addresses emerging trends that relate to climate change resilience like, smart cities, railway cities, university cities, green buildings and intelligent buildings. The three itemized research objectives under this research area bear relevance to this study. These are, a) to determine the level of awareness and challenges in adoption of climate change resilience technologies such as smart cities, green buildings and intelligent buildings in Kenya; b) to determine the impact of landscaping activities on the air circulation, sound quality and visual aesthetics; and c) to ascertain the level of use of renewable energy in construction processes and systems in Kenya. These objectives have an aim of providing a clean and conducive environment which also saves on energy.

BIOGRAPHY:

Linda is a Bachelor of Architecture graduate from the Department of Architecture and Interior Design (DAID) of Kenyatta University. She served as the pioneering Academic Secretary for the Architectural Student Association. She refined her architectural skills at the State Department of Public Works in Nairobi, developing notable experience in public and social architecture where she took up roles in design of institutional building with a focus on educational and health architecture. Linda's passion is community development, and more specifically on the psychological impact of architecture on its user wellbeing. She is an active member of the Architectural Association of Kenya.

ABSTRACT:

The Indoor Environmental Quality (IEQ) of buildings has been shown to have a significant impact on the energy consumption and correlation to architectural design of buildings. Laboratory buildings with specialized equipment and HVAC systems pose challenges in terms of efficient energy use and provision of a comfortable indoor research environment. From a review of research laboratory buildings and their thermal and visual comfort, this study aimed to identify the correlation between the facade of a building and its interior layout for the establishment of an optimal research environment. Focus was brought to bear here on the interplay of two principles of sustainable design namely energy conservation and protecting human health and comfort. The research adopted a case study approach that involved field surveys and measurements of indoor environment quality. Also, based on a building inventory survey form developed for this research, building information was obtained and it included the physical components of buildings, building performance and energy end uses. From all these, an impact assessment of design variables was deduced, and the appropriate strategies of thermal and visual comfort developed. These strategies included right sizing of ventilation apertures, thermal insulation of building envelopes, building form factor, efficient space configuration and optimal location of laboratory equipment. The key findings of this study contributed to a realization of different spatial organizations of laboratories to ensure passive transfer of heat and air in laboratories with an aim of reducing the carbon footprint and greenhouse emissions of laboratories.

KEY WORDS: **Laboratory, Thermal Comfort, Visual Comfort.**

DESIGN PROJECT DESCRIPTION: A BRILLIANT CELL - (Biomedical Research and Informatics Living Laboratory for Innovative Advances of New Technologies).

THE SITE:

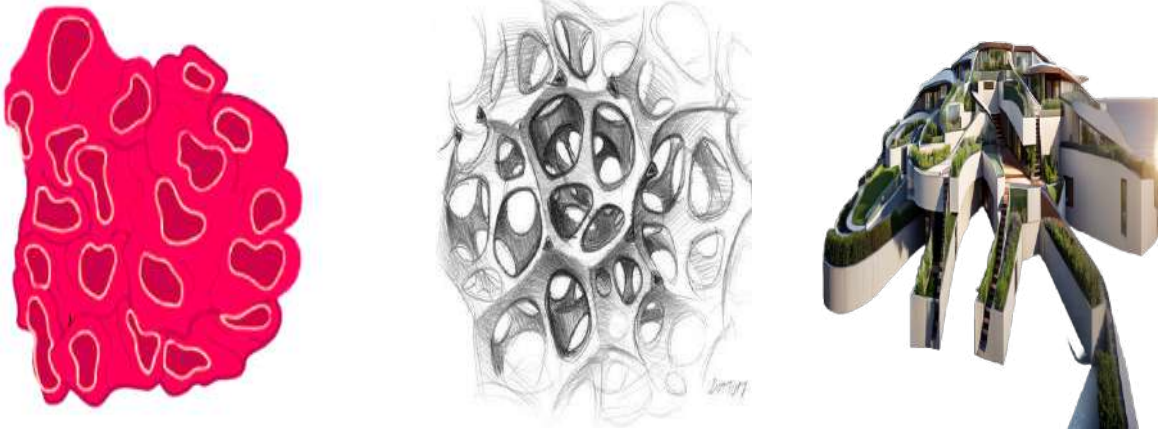
The site is located in Konza Technopolis City which is established as a satellite city of Nairobi. It is situated in the technology and life sciences band, in phase II of the development. The site is surrounded on three sides by a nature and civic park and borders to the south a Cancer Center. The site generally experiences high temperatures and low rainfall throughout the year. The project prosecuted here is the design of a Biomedical Research Institute (BRI). This BRI is conceptualized as an East African Regional Center for groundbreaking biomedical research and training.

BRIs are collaborations between world-leading universities and organizations that bring together academics and clinicians to translate laboratory based scientific breakthroughs into potential new treatments, diagnostics and medical technologies.

Figure 1: Proposed Design Site Plan. Source: Author, 2024.

The institutional building will house specialized building functions such as laboratory spaces under special environmental conditions, conference facilities, offices and learning facilities. In practice, the architect is required to inform architectural choices with inputs from electro-mechanical consultants who constitute part of the consulting team. Failure to absorb these inputs in the building design results in negative impacts on the energy performance of buildings, and also on the comfort of building occupants. An approach that ignores expert inputs of electro-mechanical engineers is incompatible with the design of low energy, high comfort buildings. It is necessary to institutionalize the design methodology and make use of an integrated design model that includes knowledge of building physics. The ability to use sophisticated simulation tools for evaluating the energy performance of the building, thermal comfort, daylighting, natural ventilation and all the passive means of reducing energy demands is central to effective design of energy efficient buildings.

THE CONCEPT:



Figures 2, 3 & 4: Project Concept Realization 01. Source: Author 2024.

The brilliant cell is a nature-based concept of a living cell: an amoeba cell. The complexity of nature was reflected on site planning where open park spaces flowed into the civic park bordering

the site. The massing was envisioned as an abnormal cell growth on the ground. The project employed regeneration of pathways with corridors cutting through the building in multiple paths.

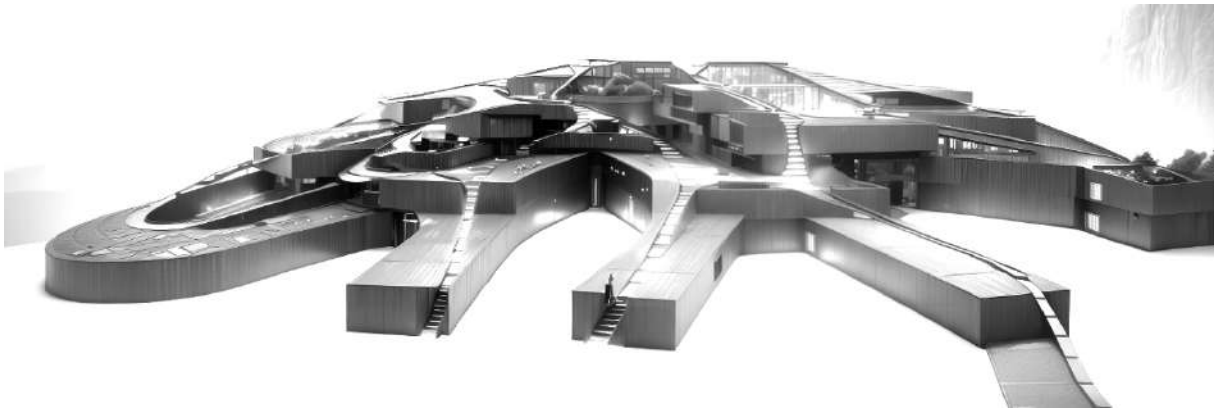


Figure 5: Project Concept Realization 01. Source: Author 2024.

THERMAL AND VISUAL COMFORT ADOPTED STRATEGIES:

Passive Daylighting and Ventilation in Non-Laboratory Spaces

Orientation of windows to wind direction and large opening sizes for effective air change rates was adopted here. Large circulation spaces interwoven into the layout to ensure passive cooling were also integrated in the design.

Figure 6: Project Axonometric Plan, 3rd Floor. Source: Author, 2024.

Figure 7:Project Axonometric Plan, 1st Floor. Source: Author 2024.

Passive Heating and Cooling of Building

High thermal performance of the building envelope was employed. The laboratories were designed to have 300mm thick masonry walls for thermal insulation. A continuous walkable roof was designed as an outer skin of the building, flowing from the ground to the top of the building. A green roof over the cascading building floors allowed for passive cooling of the building as an envelope.

Figures:8, 9, 10 & 11. Walkable roof – themes/concepts & design. Source: Author, 2024.

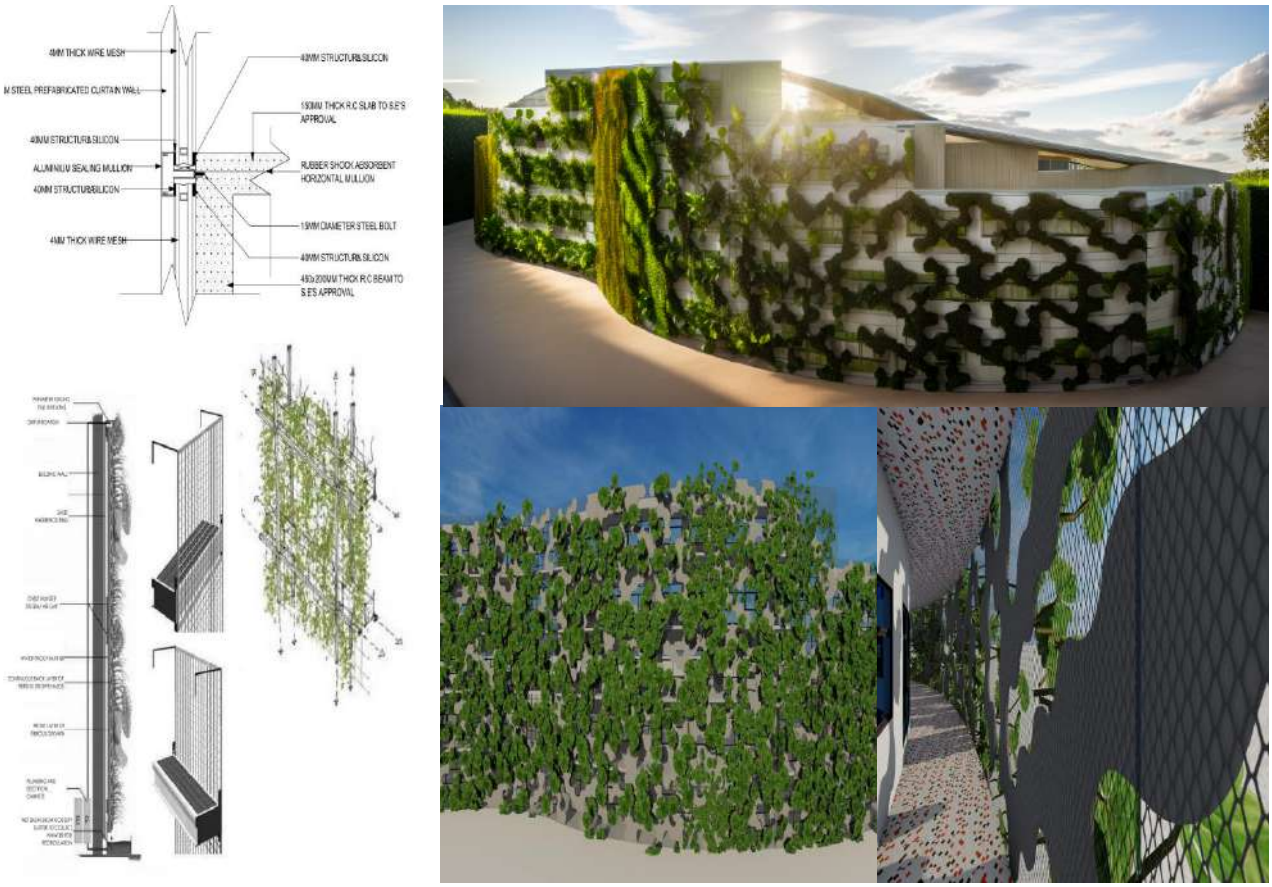
Courtyards

Courtyards within the building could be used to ventilate spaces with no access to windows such as collaboration spaces in the middle of primary spaces or offices. This effective usage of atriums was introduced in order to ventilate centrally placed open offices and reading spaces by atriums of different shapes and sizes. It allowed for the ventilation and lighting. The sizes varied from 20 to 60 meters in length.

Figure 12: Thermal and Visual Comfort Strategy - Courtyards Source: Author 2024.

Shading and Fenestrations

A curtain walling on the west side at 2500 mm offset was provided. The curtain wall was to be built of prefabricated steel with wire mesh to the architect's design. The designed motif allowed for growth of a green wall with the support of the wire mesh.



Figures 13, 14 & 15: Thermal and Visual Comfort Strategy - Green Curtain Wall . Source: Author 2024.

Laboratory Planning Concept

A *compact laboratory design.*

This concept was employed to maintain high safety levels required in laboratories. The depth of the laboratories was shallow, being of less than 6 meters depth from a window source of natural lighting. Space configuration during the planning and programming phase adopted zoning of laboratory modules based on classification -driven ventilation and lighting requirements. This dictated the grouping of all laboratory and support spaces together with the write up spaces being nearby but not necessarily within the same enclosure. The laboratory spaces and support spaces could therefore be grouped into one end of the building with the write up spaces on the other end of the building.

Passive Air Transfer

The strategy here was of a passive transfer, as air would naturally move from areas of high pressure to areas of lower pressure. For instance, air would move from the office and classroom spaces to the atrium and laboratory spaces. In laboratory building design it is critical that the mechanical systems, particularly the air system, be integrated with the architecture, especially when trying to achieve a reduced energy use index (EUI).

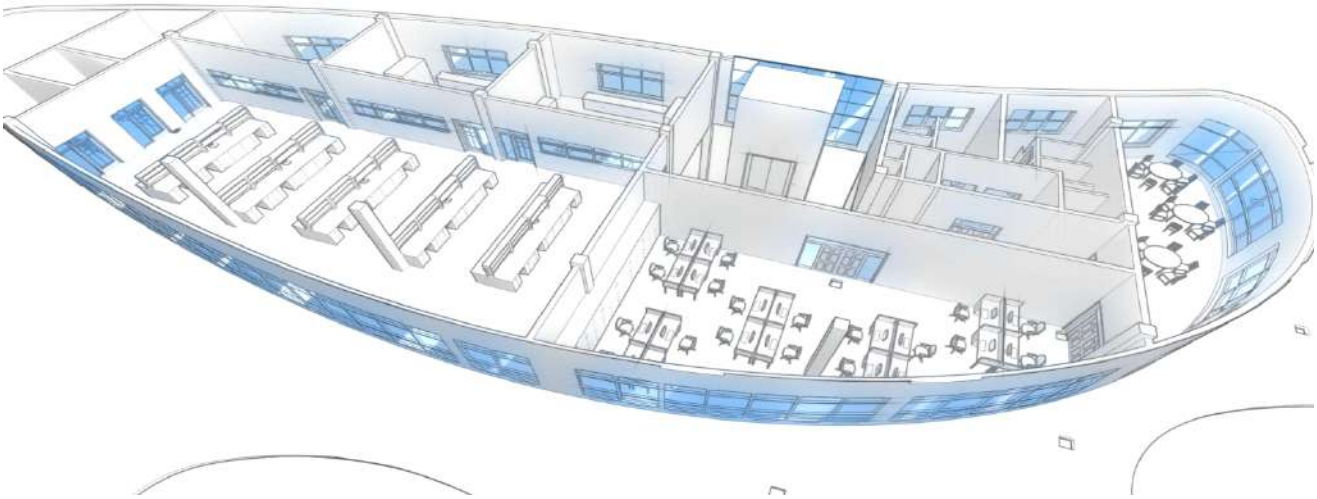


Figure 16: Thermal and Visual Comfort Strategy - : Laboratory Planning Concept. Source: Author 2024.

ANALYSIS OF ACOUSTIC COMFORT IN PERFORMANCE ART THEATRES: Cases of The Kenya National Theatre and Kenyatta University Amphitheatre.

Researcher: Jamillah Anyango Okello, B.Arch., Studies. Hons, 2023/4, KU, jamillahokello99@gmail.com.

Supervisor: Architect Jack Gitonga, Lecturer (DAID) Kenyatta University, jackgitonga@gmail.com.

SDG 11: Sustainable cities and communities/**A- 2063 G1**: A high quality of life/standard of living for all citizens.

SDG 11 Theme: Inclusive, safe, resilient and sustainable cities and human settlements/**A- 2063 G1 Theme:** Modern, affordable and liveable habitats and quality basic services.

Sub theme: Acoustic Comfort in Performance Art Theatres.

Alignment to Vision 2030: Provision of acoustic comfort in performance arts theatres falls under the social pillar. More specifically, this study contributes to the social strategy 5.6 that pursues investing in the people of Kenya with particular interest in gender, youth and vulnerable groups.

Alignment to NACRA: The research embraces research in the specific technical discipline 1 on Construction technology and materials within the overall National Construction Research Agenda (NACRA) in order to promote quality in the built environment.

BIOGRAPHY:

Jamillah is a graduate architect of the Department of Architecture and Interior Design (DAID) in School of Engineering and Architecture at the Kenyatta University. She has displayed commendable academic excellence over the years she has studied architecture in the institution. Jamillah took up critical roles in Arplad Architects Limited, Renaissance per salut Architects, Designspec Limited and SK Archplans Architects and Town Planners. She champions advancement of architectural knowledge in the built environment.

ABSTRACT:

This study investigates acoustic comfort in performance of two of Kenya's art theatres located in the city of Nairobi. Theatres offer performances such as opera, dance, drama and musicals. Good acoustics for speech and music are often incompatible. Music then feels dead in drama theatres natural speech difficult in concert halls. Different theatres and functions therefore need unique configurations and acoustic considerations. Acoustic comfort is the management of theatre acoustics that ensures an environment where speech and music are heard clearly without distortion or unwanted noise. The most important factor affecting speech intelligibility and music clarity is the reverberation time, the time taken for sound to decay by 60 decibels after the source of sound stops. The research methodology here blended in qualitative and quantitative approaches. The qualitative approach using the case study method, analysed building materials and surface

materials with respect to acoustic comfort. The quantitative (non-experimental design) approach measured associations between the variables in the study of shape, size, volume and surface materials of the theatres. The study confirmed the factors influencing acoustic comfort to include reverberation time, theatre form, volume and size (being critical for sound propagation and distribution), functional use, surface materials, ceiling design, balcony and overhang design and sound insulation. Additionally, that the types of surface materials used in the theatre are essential in sound diffusion and sound absorption in accordance with the functional use of the theatre. Further that surface materials affected the reverberation time of a theatre; being essential in sound diffusion and sound absorption in accordance with the functional use of the theatre. Sound insulation was tagged essential in preventing external noises from penetrating into the interior of the theatre. For this, use of soundproof materials, thick walling, sealed doors and double-glazed windows was necessary. Acoustic comfort in theatres would with, integration of architectural design and science of materials resulting in an enjoyable auditory experience.

KEYWORDS: **Acoustic comfort, speech intelligibility, sound insulation & propagation.**

DESIGN PROJECT: DESIGN OF PERFORMANCE ART THEATRE COMPLEX IN KITENGELA, KAJIADO COUNTY.

THE SITE:

Kitengela town is located in the outskirts of Nairobi along the Nairobi-Namanga Road and is a fast-rising business hub in the region. Kitengela attracts a wide variety of diverse cultures that have currently inhabited the area. The site selected borders the Kitengela bus and matatu terminus, The chiefs camp, Kitengela market and the Kenya Commercial Bank. The site is suitable for the construction of a performance art theatre complex due to its location in a civic

Figure 1: Kitengela project site. Source: google maps, https://maps.app.goo.gl/zJQ9V8zKThvQ2MD4A, 2024.

zone. The site is also in close proximity to the main road thus shall have a high influx of theatre goers and also create employment for the local youth.

THE CONCEPT:

The design project is a performance art theatre complex with scientific, technological and innovative acoustic standards that shall promote an enjoyable audial experience for the audience. The performance arts theatre complex is conceptualized to be designed as shell within a shell which translates to building within a building.

Figure 2: Exterior of theatre. Source: Author, 2024.

Figure 3: Building within a building. Source: The Architectural Review, 2020.

The theatre being the main component of the whole design process is located centrally within the inner shell as the support facilities encircle it within the outer shell. The theatre is designed to meet the parameters of acoustic comfort listed below.

Theatre form

a) A rectangular shape that allows for early lateral reflections of sound. This though has a major disadvantage of parallel walls producing flutter echoes.

Figure 4: Madison Symphony Orchestra. Source: Architectural Acoustics, 2016.

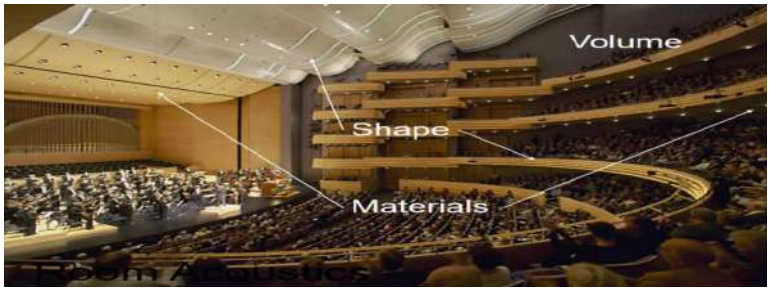


Figure 5: Madison symphony orchestra. Source: Architectural acoustics, 2016.

b) A fan shape which prevents the formation of flutter echoes by sidewalls. Sound reflected from the rear wall still reaches the auditorium with significant delay.

Theatre volume and size

The volume per seat ratio should be 5.7 to 6.8 cubic meters achieved by a volume of less than 14,158 cubic meters to control Reverberation. The floor area of the theatre including gangways should be calculated based on 0.6 to 0.9 square meters per person.

Surface materials

a) Ceiling – Here use is made of reflective materials such as concrete , thick wood, and gypsum. The perimeter along both sides and rear should be sound absorbing.
b) Seating - Fabric upholstered seats are preferred.
c) Sidewalls- These assume the form of many imperfections as possible in sound reflective and diffusing surfaces.
d) Rear walls - Diffusing surfaces with large irregularities are used. These are treated with carefully placed sound absorbing finishes.

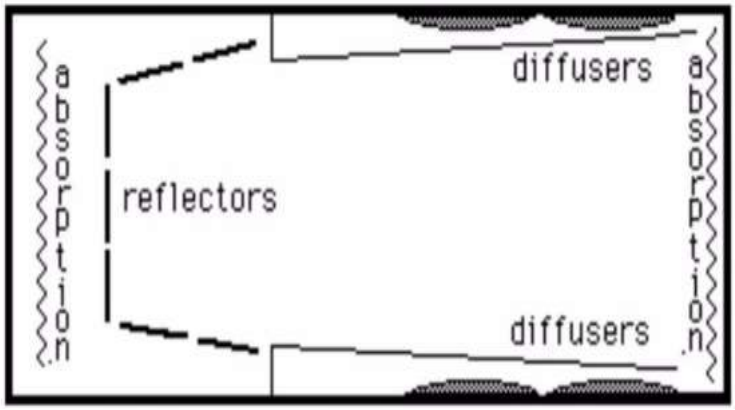


Figure 6: Acoustic treatment of the concert hall. Source: Pinterest, 2024.

e) Flooring - All aisles will be carpeted except infront of the stage.

Balcony and overhang design

The idea is to keep the depth of the overhang shallow (should not exceed twice the opening height). The balcony front is treated with sound diffusing or sound absorbing finishes. Balcony faces will have convex features.

Ceiling design

Hard ceiling such as gypsum is preferred. A shaped ceiling formed by splitting the surface into angled planes is favoured. The ceiling above the proscenium arch will have a convex and horizontal reflecting surface at the proscenium wall.

Reverberation time

This to be 1.4s to 1.9 s at mid frequencies (average reverberation at 500 and 1000HZ) in order to achieve optimal acoustics for different types of performances.

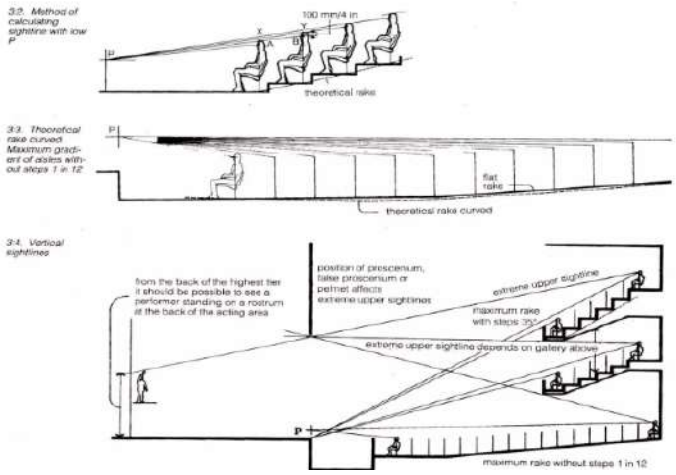


Figure 7: Balcony design. Source: Auditorium Acoustics, 2023.

Functional use

The theatre will be used for multipurpose use such as dance, drama, musicals and opera.

THE DESIGN:

Figure 8: Interior of theatre. Source: Author, 2024.

The main focus of the design is the acoustic comfort strategies employed within the making of the performance art theatre complex. The design of the interior of the theatre ensures that most of the findings of the research thesis parameters have been implemented. The volume per person obtained in the design is 6.92 cubic meters which is closely within range of an optimal volume per person of 5.7 to 6.8 cubic meters. The floor area per person obtained is 0.90 square meters which is ideal for the audience. The form of the theatre is a combination of the fan shaped and shoebox theatre with sidewalls that are splayed so as to prevent formation of flutter echoes that arise due to parallel walls. The surface materials used in the theatre enhance absorption, reflection and diffusion of sound. This is witnessed in the images above and alongside here, showcasing patterned acoustic diffusers and upholstered seating to enhance absorption of sound. The theatre features a shaped, angled ceiling cut in planes to enhance reflection of sound. The balcony fronts are convex shaped to scatter sound, eliminate long delayed reflections and echoes. The acoustic strategies employed in the design ensure an enjoyable auditory experience for the users.

Figure 9: Kitengela Performing Arts Theatre Complex. Source: Author, 2024.

ARCHITECTURE FOR FLOOD RESILIENCE AND POST DISASTER RECOVERY - THE POTENTIAL INTERVENTIONS IN KISUMU CITY COUNTY.

Researcher: Jayshree Rehema Osore, B.Arch. Studies. Hons, DAID, SEA, KU, jayshreerehema@gmail.com

Supervisor: Prof. Arch Alfred Odhiambo Omenya (PhD), Professor of Architecture & Planning, DAID, SEA, KU, alfred.omenya@ku.ac.ke

SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable/**A-2063 G1:** A high standard of living, quality of life and well-being for all citizens. Modern, affordable and liveable habitats and quality basic services for all.

SDG 11 Theme: Substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards mitigation and adaptation to climate change, resilience to disasters.

Alignment to Vision 2030:

This study supports the social pillar , working within the social strategy of investing in the people of Kenya. It resonates with the objective 5.4 on environment in its stated intention to enhance disaster preparedness in all disaster-prone areas to improve the capacity for adaptation to global climatic change.

Alignment to NACRA:

As per the NACRA priority area 16 the research reinforces the interest for Integrated Disaster and Risk Management (IDRM) and Preparedness in construction sites in Kenya. The objective of this research area is to establish the level of disaster awareness and preparedness in the construction industry in Kenya. The goal being the development of a policy on integrated Disaster and Risk Management (IDRM) and Preparedness. Research area 23, looks into the emerging trends that relate to climate change resilience like amphibious buildings. It advocates for the determination of the level of awareness and identification of challenges when adopting emerging pertinent technologies for resilience to climate change such as floatable buildings in Kenya.

Alignment to the New Urban Agenda (Habitat III):

The study is founded on the United Nations Office for Disaster Risk Reduction strategic framework 2022-2025, In line with Priority for Action 2 of the Sendai Framework, aims to strengthen disaster risk reduction governance at local levels. It conforms to the desired alignment with the following four strategic objectives. 1). Generating and sharing knowledge on effective

disaster and climate resilience approaches for improved policy and practice. 2). Adoption of Risk-informed development at national, sub-national, and community level, using integrated, inclusive, and participatory approaches. 3). Disaster preparedness and resilient recovery capacity are increased.

BIOGRAPHY:

Jayshree Rehema is a graduate architect from the Department of Architecture and Interior Design (DAID) of Kenyatta university. Over the years she has refined her skills at Domysuma Architects and the State Department for Public works, developing notable experience in conceptualization, as well as in innovative and sustainable design solutions. Arising from her exemplary academic achievements, she won the Crown Paints Award of Excellence in 2021. Her passion lies in sustainable and resilient architecture. Jayshree's research interests embrace the impact of blue infrastructure and natural landscapes, resilient structures and materiality in the resilience of architecture.

ABSTRACT:

In recent times, with the effects of climate change, flooding has become common. The need to understand best-practices in resilience-based built-up places is therefore critical for all professionals in the built environment. The study sought to identify various architectural interventions for flood resilience. By employing a qualitative and quantitative research approach and working through the elements that conform a building the study picked out flood resilience strategies. Global flood resilience precedents were examined through the practices developed in the Netherlands, Japan, Britain and the nations affiliated to CANZUS. It was then enabled to look into the effectiveness of interventions in Kisumu County, reviewing their compliance to the international standards (the ACSE 24 code, USA). This was done by assessing the site flood history, the structural strategies employed, and materialism in reference to test results of the performance of materials under long-term exposure. In the attempt to understand the uptake of flood resilience strategies, the study probed the arguments on failures and their causes, cost implications of resilience-based design and the reasons for compliance and noncompliance to set standards. Key findings showed that avoidance was the most commonly used strategy for flood resilience since it offered a higher level of the perception of safety. Water acceptance was not thought to be a strategy for resilience. Very few developers, professionals, and stakeholders considered flood resilience for construction, citing high initial costs as the reason. Enhancing compliance to flood resilient architecture standards should be prioritized by all policymakers and stakeholders involved in urban development for a sustainable future. Moreover, public education and effective strategic communication regarding flood risks and resilience, should be given primary importance. Recourse to holistic resilient design is advisable and this would result in reduced risk and safe habitats.

KEY WORDS: **Flood Resilience, Resilience Based Architecture, Flood Risk Reduction.**

DESIGN THESIS: DISASTER RELIEF, TRAINING & RESEARCH FACILITY.

THE BRIEF

The Disaster Relief, Training and Research Facility aims to serve as an epitome of flood resilience. The project showcases the various interventions towards flood resilience, both as an example and

an exhibition space. This project seeks to optimize strategies for resilience by using complementary approaches. It integrates nature-based solutions, site level interventions and building level techniques and in this way setting a new standard for resilience-based architecture.

THE SITE:

The Disaster Relief, Training and Research Facility is an innovative project designed to blend all strategies of flood resilience at the architectural scale and nature-based site interventions. It is located on a 6-acre site within the Kano plains on the banks of river Nyando of Kisumu County. This facility epitomizes a harmonious balance between water and architecture.

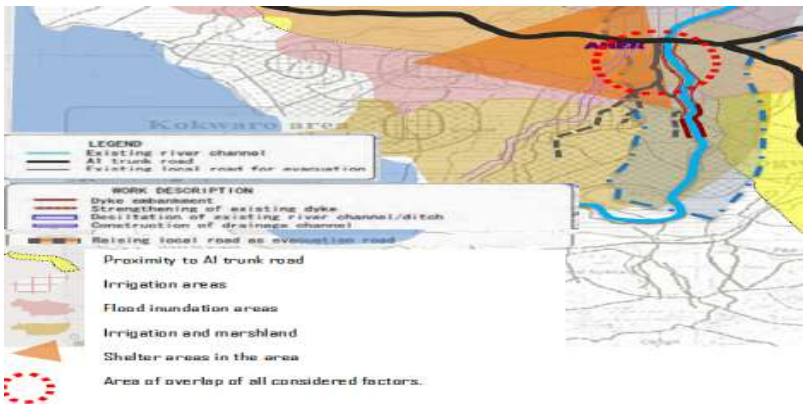


Figure 1: Mapping for ideal site for the project. Source: Author, 2024 – Adapted from ((JICA), (MWI), & (WRMA), 2009).

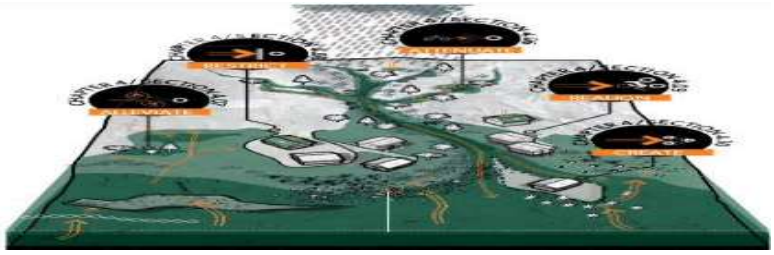


Figure 2: The embrace tactic of flood resilience. Source: Barsley, 2020.

THE CONCEPT:

Blurring the lines of separation, the concept of the new edge suggests a shifting shoreline or a flexible waterline as part of the programme. Rather than defending the fixed threshold, it is critical to harness the value of being close to the water. This not only allows the waters into the flood plain and living with the water but also make room for the river. The EMBRACE concept makes use of all the resilience strategies at a site landscape and building level.

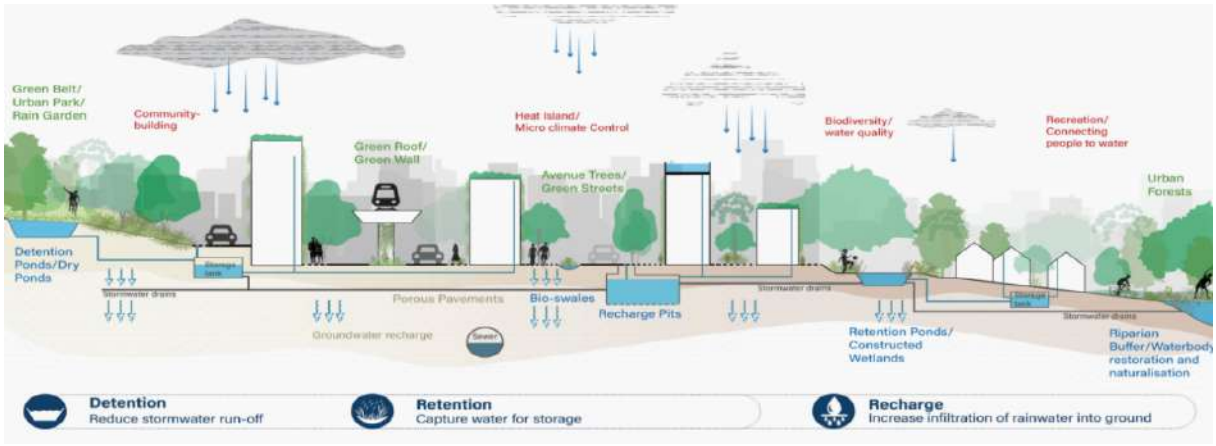


Figure 3: Conceptual section of an urban flood resilient city using Water Sensitive Urban Design(WSUD). Source: Ashwathy Anand, 2021.

THE DESIGN:

Site level interventions

It is a combination of similar concepts, vis: Sustainable Drainage Systems, Water Sensitive Urban Design and the sponge city concept and its concern for storm water management that adheres to the following six (6) principles.

Figure 4: Site plan showing site level flood interventions. Source: Author, 2024.

Infiltration. This intervention employs the use of porous paving and driveways for maximum infiltration.

Detention. The use of retention and detention ponds/bio swales to contain excess runoff where infiltration is at a slower rate. The ponds drain into canals connected to the rice plantations downstream.

Storage, Purification and onsite Utilization of excess rainwater.

Drainage and discharge into the river channel.

Building level interventions

Located in a riverfront setting, the facility structures incorporate the following flood-resilient strategies:

- **Avoidance by elevation**: Strategic building elevation and horizontal displacement to ensure a significant portion of the building is beyond the reach of flood waters. The site base flood elevation was determined for the 100-year period and used as a reference level.
- **Water resistance**: Facilitating efficient resistance by using flood barriers both manually operated and automated. Coupled with waterproof materials these barriers keep flood waters out of the building.

Figure 5: 3D impressions of the buildings in the river context. Source: Author, 2024.

Figure 6: 3D impressions of the buildings in the river context. Source: Author, 2024.

- **Water acceptance**: Reducing flood damage by embracing flood water and using the phenomenon as part of the programme. The water-accepting spaces are used as inundation and material testing labs.

- **Adaptability by floating**: Enhancing the experience of access and the resilience by using buoyant pathways and space floor slabs. Maintaining circulation paths in a flood scenario ensures a resilient usable campus

EVALUATION OF THERMAL COMFORT IN INSTITUTIONAL BUILDINGS IN NAIROBI CITY COUNTRY: A case study of Britam Towers & KCB Towers in Upper Hill.

Researcher: Peter Onyango Osore, B.Arch. Studies. Hons,2023/4, KU, osorepeter.arch@gmail.com.

Supervisor: Prof. Alfred Omenya(PhD), DAID,SEA, K.U, omenya.alfred@ku.ac.ke.

SDG 11: Sustainable cities and communities/**A-2063 G7**: Environmentally sustainable and climate resilient economies and communities.

SDG 11 Theme: Inclusive, safe, resilient and sustainable cities and human settlements/ **A-2063 G7** Theme: Climate resilience and natural disasters preparedness.

Sub theme: Thermal comfort: A bio climatic approach to sustainability in sub-tropical highland climates.

Alignment to Vision 2030: This research is anchored on the social pillar whose main goal is to build a just and cohesive society with social equity in a clean and secure environment. Policies under this pillar are informed by foundation 3.6 on Science, Technology, and Innovation (STI).It seeks to integrate innovation in development; and for the purpose of this study then innovative design strategies and application of bio climatic design principles to enhance sustainability. This research further contributes to the social strategy 5.4 on Environment which aims to secure a clean and sustainable environment by 2030. Kenya aims to be a leader in environmental conservation and set benchmarks for eco-friendly building practices in the region and reducing environmental footprint through sustainable resource management and in practicing climate-responsive design approaches.

Alignment to National Construction Research Agenda NACRA: This research embraces research on discipline or subject area number 5 of the National Construction Research Agenda (NACRA) regarding Environmental issues. Here it focuses on research area 23 which addresses emerging trends related to climate change resilience like smart cities, railway cities, green buildings and intelligent buildings. The three outlined objectives within this research area are pertinent to this study and include: a) to determine the level of awareness and challenges in adoption of climate change resilience technologies such as smart cities, green buildings and intelligent buildings in Kenya; b) to determine the impact of landscaping activities on the air circulation, sound quality and visual aesthetics; and c) to ascertain the level of use of renewable energy in construction processes and systems in Kenya. These objectives aspire to create a clean and conducive environment while also promoting energy efficiency.

BIOGRAPHY:

Peter is an award-winning graduate architect from the Department of Architecture and Interior Design (DAID),at Kenyatta University. He has won several awards including the AAK design competition on climate-responsive school design (2021) and the Crown Paints Award of Excellence (2021). Peter also contributed entries for the Norman Foster Foundation workshop (2022), African Union of Architects awards (2024), Kounkey Design Initiative (2023), and the Kahuhia Girls' School dorm design winning entry (2022). He served as an academic secretary of the Architecture Students Association at a time when he also co-founded Rafiki Consult- a design and build firm focusing on environmental design. His architectural research interests include environmental design, health care, and humanitarian architecture. He aspires to pursue further studies in this field.

ABSTRACT:

Climate change is a pressing global concern, particularly impacting tropical regions where rising temperatures pose significant challenges to society, economic well-being, and the built environmentt. High-rise buildings, that are prevalent in rapidly urbanizing cities like Nairobi, worsen these challenges. This necessitates the pursuit for sustainable design solutions. This research resonated with broader efforts to address challenges of climate change, promoting sustainable urban development. Extensive literature review to this effect highlighted the importance of responding to local climatic conditions in architectural design to mitigate climate change impacts. This study focused on thermal comfort in high-rise buildings in Nairobi, situated within a subtropical highland climate. A general absence of updated information on local precedence for appropriate design that was noted in existing literature, was addressed by exploring Nairobi's unique climatic conditions, and the influence of high-rise structures on thermal conditions for occupants. By bridging the gap between theory and practice, knowledge in the field was refined. A mixed-method approach, that blended quantitative and qualitative research approaches was employed. Insights arising out of occupant surveys and interviews of key informants or expert were sought for. In this way comprehensive insights into thermal comfort dynamics of high-rise buildings emerged. Through relevant statistical analysis, time series comparisons, and simulation, the study sought to identify optimal strategies to enhance thermal comfort in institutional buildings. For instance, findings from this study revealed that Britam Towers and KCB Towers exhibited minimal variations in thermal comfort figures with Britam Tower having an average of 24.0°C indoor temperatures and KCB Towers having an average of 24.6°C. This minimal difference was attributed to the facade shading systems and ventilation strategies such as double skin facade and use of solar fins in both buildings. Equally, Natural ventilation strategies in both towers enhanced air circulation, with KCB Towers (with an average indoor air speed of 0.30 m/s) achieving up to 23.3% improved airflow compared to Britam Towers (with an average indoor air speed of 0.23 m/s), resulting in greater thermal comfort for occupants. These findings inform sustainable design practices, supporting more comfortable and liveable urban environments, in Nairobi and similar climatic zones globally. It is necessary to integratee climate-responsive design principles into contemporary architectural discourse and practice. This would facilitate the development of resilient urban spaces capable of mitigating the impacts of climate change.

KEYWORDS: **Passive cooling strategies, solar heat gain.**

DESIGN PROJECT DESCRIPTION: ENVIRONMENTALLY RESPONSIVE RESOURCE CENTRE - UPPER HILL, NAIROBI

Figure 2: Overall outlook of the proposed resource centre design. Source: Author generated; 2024

PROJECT/BACKGROUND:

The resource centre is intended to respond to local environmental conditions providing thermal comfort and user experience. With a focus on sustainability, the complex encompasses five main sections including a public facility with a resource centre, a training zone, a research centre, restaurant and dining zones, the tower/office block and an outdoor amphitheater. The project brings together the two main project interests which are the subject area in which the research was conducted, and the client (Tana and Arthi River Development Authority, TARDA) needs in the same area. The project's main objectives are to achieve environmental sustainability, integrate bio climatic design principles, foster community engagement and inclusivity, build Resilience to climate change and to prioritize mixed-use efficiency and sustainable mobility.

THE SITE AND CONTEXT:

The site is situated along Kigali Road, off Mara Road and Chyulu roads in Nairobi's Upper Hill area, approximately 3.1 Kms from the Central Business District (CBD). It is situated in a dynamic metropolitan area characterized by a diverse mix of residential, commercial, and recreational spaces such as the Britam Tower and KMA Center to the south, NCBA Center and Capital Police to the east, NHIF Building to the north-east, and the National Library to the north. The site benefits from excellent accessibility via major transit routes and is embedded in a culturally rich environment with a blend of Kenyan and eastern architectural influences.

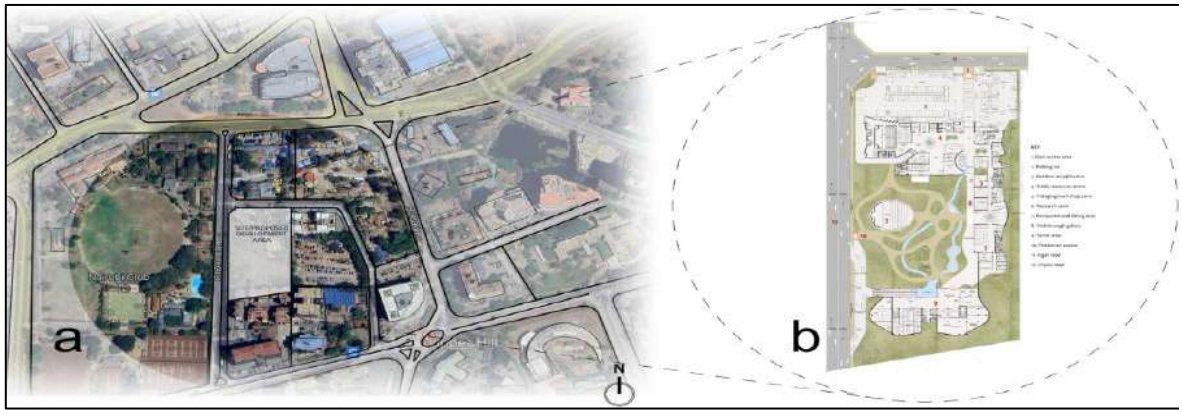


Figure 3: Site location (a) and Site Plan (b) . Source: Author generated; 2024

CONCEPTUALIZATION:

Deriving its concept from environmental design principles, the complex is oriented to maximize use of natural/day light while reducing solar exposure/heat gain. It uses kinetic facades to enhance heat rejection, sun shades and vertical fins for solar rejection, and green roofs to reduce heat gain. The complex equally puts into place use of materials and construction technology including use of bamboo facades, low e-glass and a cooling chimney. The design ascribes to the form follow climate dictum in the order described here below:

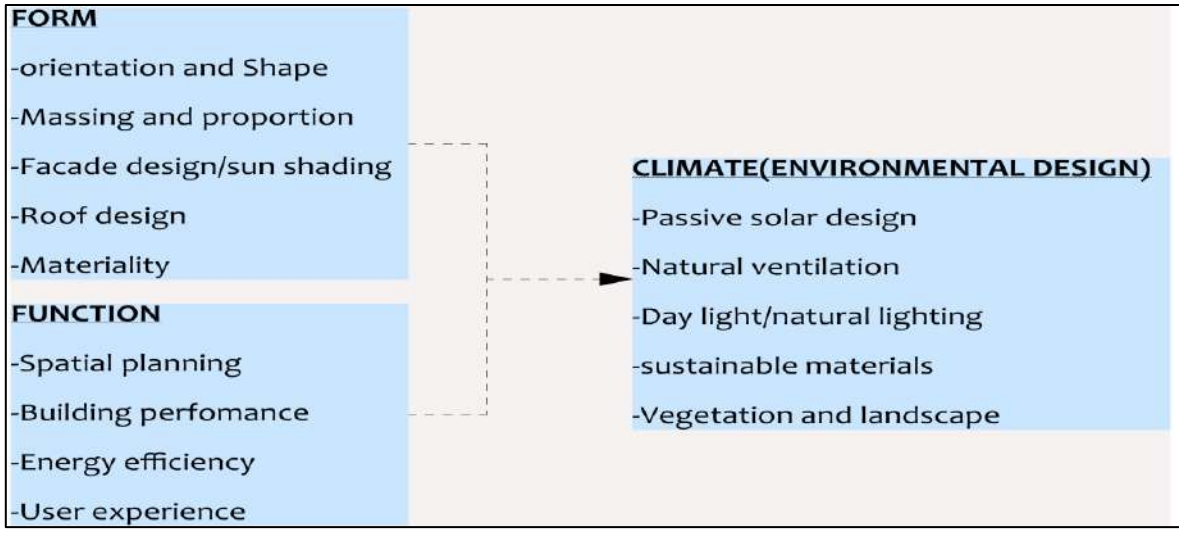


Figure 4: Author interpretation of form follows climate dictum. Source: Correa, Charles. A Place in the Shade: The New Landscape & Other Essays. Penguin India, 2010.

The main design guidelines include material use and technology (high performance glass), green roof, cooling chimney and cooling waterfall façade, cooling pools, use of atria, use of high ceilings and double volumes, use of kinetic facades and use of passive design strategies such as cooling

fins and design for cross ventilation. The form/envelope design is modeled after the fluid nature of the river which is the main jurisdiction of the client.

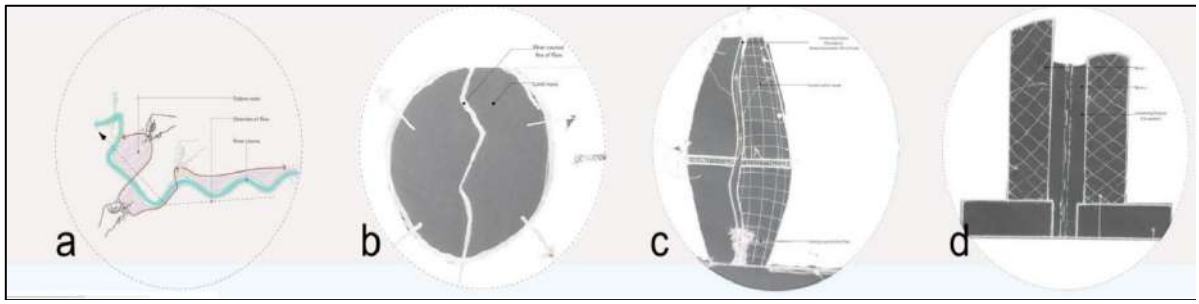


Figure 5(a-d): Conceptual abstraction of the design form. Source: Author generated; 2024.

Overall site arrangements consider principles of massing, spatial relationships and privacy gradients in order to enhance functionality.

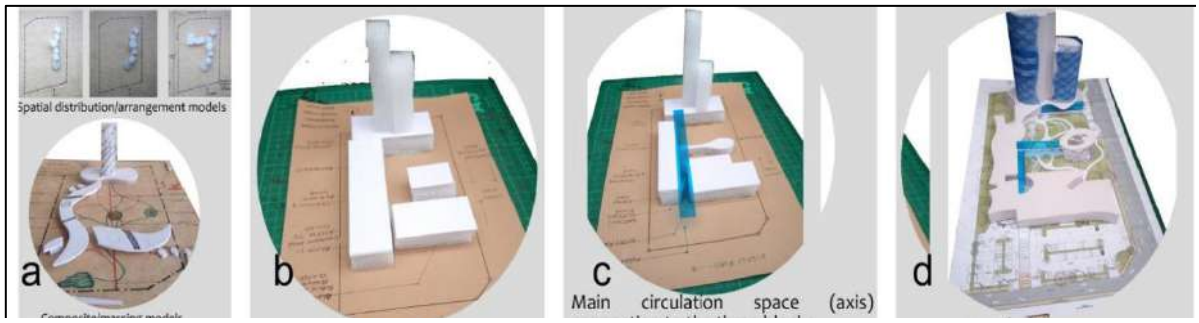


Figure 6(a-d): Massing, spatial relationships and privacy gradients of the whole complex. Source: Author generated; 2024.

APPLIED THERMAL COMFORT DESIGN STRATEGIES:

1. **Solar protection through envelope design.** This strategy was applied in three main ways namely: Use of double skin envelopes which create an insulating barrier, use of kinetic facades which adapt to changing sunlight conditions and use of sun shading devices like louvers and fins which block excessive solar radiation, maintaining a cooler and more comfortable indoor environment.

Figure 6: Use of sun shading fins for solar protection. Source: Author generated; 2024

Figure 7: Use of double skin envelope for solar protection. Source: Author generated; 2024

2. **Passive solar design to enhance natural and cross ventilation.** This strategy was achieved in the following ways: The use of courtyards and atrium to enhance natural and cross ventilation

by allowing air to flow freely through the building, and in this way reducing the need for mechanical cooling; application of cooling chimneys, combined with water features like roof ponds and facade waterfalls which cool incoming air, promoting effective thermal regulation: and use of roof gardens and green roofs which provide additional insulation.

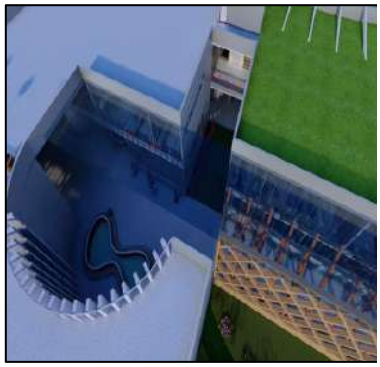
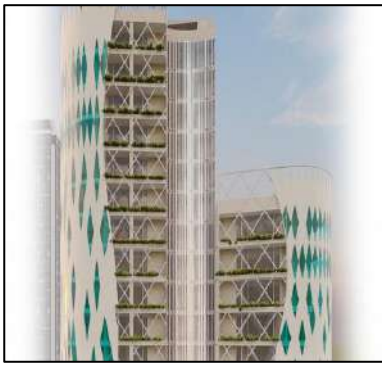




Figure 8,9 &10: Achieving passive solar design through features such as Atria, double skin facade and use of high volumes. Source: Author generated; 2024.

3. **Material use and selection.** Specification of local materials such as high thermal mass masonry to reduce heat gain and wooden louvers ensured that that the materials used have a very low embodied energy reducing the overall carbon footprint of the building. Equally, the main facade material, Low E-glass, was used for its energy efficiency. Accordingly, it reduced heat transfer by reflecting infrared light while allowing natural light to enter.

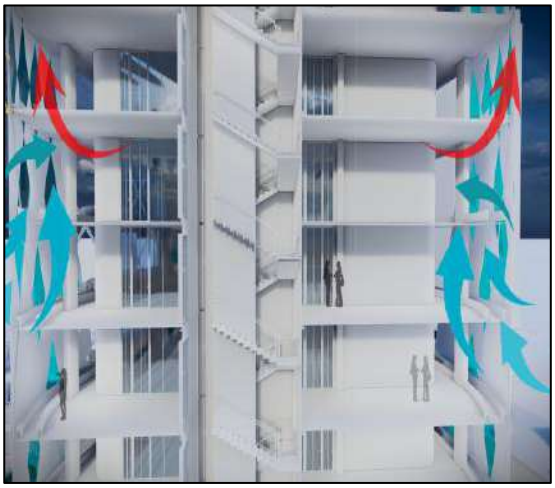



Figure 11 & 12: Reducing heat gain and carbon footprint through materials such as low e-glass, wooden louvers and masonry walling. Source: Author generated; 2024.

4. **Overall building form and orientation/site arrangement.** Orientation was a key element in this design for thermal comfort. Longer facades of the building were oriented in the north-south

direction to ensure minimum solar heat gain. This strategy also maximized on natural day lighting enhancing energy efficiency.

The strategic integration of environmental design principles in buildings not only reduces energy consumption but also sets a benchmark for sustainable architecture, ensuring long-term resilience in regions experiencing subtropical highland climates.

Figure 13 & 14: Achieving passive solar design through building form and orientation. Source: Author generated; 2024.

Figure 15: Achieving evaporative cooling by use of artificial rivers. Source: Author generated; 2024.

MUSEUMS AS CULTURAL CENTRES - A STUDY ON FIT-FOR-PURPOSE VERSUS EVOLVED MUSEUM BUILDINGS.

Researcher: Njeri Mbugua, B.Arch. Studies,Hons, 2023/4, KU, mbuguanjerih3@gmail.com

Supervisor: Arch. Judy Kebenei, Lecturer, DAID, KU, kebenei.judy@ku.ac.ke

SDG 11: Sustainable Cities and Communities/**A-2063 G16**: African cultural renaissance is pre-eminent.

SDG 11 Theme: Strengthen efforts to protect and safeguard the world's cultural and natural heritage/**A-2063 G16 Theme:** Cultural heritage, creative arts, and businesses.

Sub-theme: Preservation of Cultural Heritage within the Kenyan context.

Alignment to Vision 2030: This inquiry supports the economic pillar, whose aspiration is to maintain a sustained annual economic growth of 10% over the next twenty years. Within this pillar the study finds a domain in the economic vision and strategy whose focus is on adding value to our products and services. A critical goal in this strategy seeks to promote tourism (4.1) with an aim to place Kenya among the top 10 long-haul tourist destinations in the world. In this context, Kenyan tourism would offer a high-end, diverse and distinctive visitor experience that few of her competitors can match. Specific strategies that relate to this study, geared to achieving such goals include creating new high-niche products such as cultural, eco-sports and water-based tourism.

Alignment to NACRA: Research here embraces the specific technical discipline of the National Construction Research Agenda (NACRA) (1) construction technology and materials. Within this discipline it in some respects, addresses the particular research area (1) that concerns suitability and adoption of local/indigenous construction materials. Particular value is gained in the objective (b) of this research area. This objective has an interest that relates to a core consideration of museum design in its drive to establish the suitability of indigenous vernacular/cultural construction materials such as makuti, thatch, mud (Maasai hut), volcanic ash, quarry dust and white coral stones.

BIOGRAPHY:

Njeri is a graduate architect from Department of Architecture and Design (DAID), Kenyatta University. She has grown her skills through internships at Linkage Architects and architecture competitions. Her professional passion lies in inclusive design, particularly for marginalized groups like persons with disabilities (PWDs) and the elderly. A project undertaken in her fourth year, the Korogocho Slum Upgrading Programme (KSUP), ignited this passion. The project demonstrated the importance of integrating design within the urban landscape and emphasizing the need to create inclusive structures that truly meet people's needs by actively listening to them.

ABSTRACT:

This study explored the significance of museum buildings in Kenya. It recognized their pivotal role in preserving cultural heritage and fostering societal engagement. Originally, African museums served colonial powers and elites rather than local populations. After independence, these institutions became symbols of nationalism and collective identity, representing freedom and transformation. The objectives set for inquiry in this study encompassed understanding the design and functioning of museum buildings, evaluating their suitability for intended purposes and investigating relevant optimization strategies. The research also aimed to explore future developments and innovations in museum architecture, contributing to the ongoing dialogue on the evolving roles of cultural institutions. The research employed a qualitative research approach, utilizing the case study method with comparative analysis to compare an evolved museum building against a purpose-built museum building. Data collection involved conducting individual and focus group interviews guided by structured interview schedules, administering questionnaires, carrying out observations with annotated checklists, and conducting archival reviews. The inquiry afforded the study a detailed understanding of the architectural landscape of museums in Kenya. In this regard, it emerged that museum architecture in Kenya prioritizes spatial layout to enhance visitor experience, with attention to circulation, accessibility, and flexibility. Materials were chosen for preservation, LED lighting for its low heat output and varied exhibits to encourage longer and repeat visits. Focal points, clear signage and rest spaces were key in improving traffic flow and visitor enjoyment. Further, the following broader impacts beyond architectural considerations that were identified included socio-economic benefits, such as employment opportunities and revenue generation through commercial spaces, and environmental impact, with the purpose-built museum becoming the first in Africa to achieve EDGE certification. Nuanced insights into challenges and opportunities for both purpose-built and evolved museum buildings within the Kenyan context that were seen here included fostering Pan-African exhibitions, repatriating stolen Kenyan artifacts, introducing children's museums, incorporating technical and audio-visual elements in exhibitions and frequently updating permanent galleries. Recommendations that emerged to enhance the overall efficiency, accessibility, and cultural relevance of museum buildings included versatile layouts, flexible materials, dynamic lighting, varied exhibit techniques for broader learning and regular testing and iteration of way-finding solutions. These recommendations will serve well to guide architects, policymakers and cultural institutions in making informed decisions that balance the preservation of cultural heritage with the adaptation to contemporary societal needs and expectations.

KEY WORDS: **Cultural heritage, Purpose-built cultural museum centres, evolved museums.**

DESIGN PROJECT DESCRIPTION: AN INDUSTRIAL-CULTURAL MUSEUM (MILELE INDO-CULTURAL MUSEUM)

THE SITE:

The project is located in Nairobi County, within the existing 5.7-acre premises of the Nairobi railway museum. This project strives to elevate the current Nairobi railway museum by proposing a design that seamlessly integrates elements of both infrastructural and cultural heritage. The primary objective is to foster a sense of unity and appreciation for Kenya's shared history. This design project addressed several on-site challenges, including the potential loss of industrial heritage, the museum's perceived lack of ongoing relevance and the colonial associations of its

collections. The current museum was originally established to preserve and showcase the heritage and records of the railways of East Africa, from their inception to the present day. It is an establishment responsible for safeguarding Kenya's industrial legacy, serving as a center for learning and scholarly exploration and providing a stage for commemorating the contribution of this heritage to the nation's development.

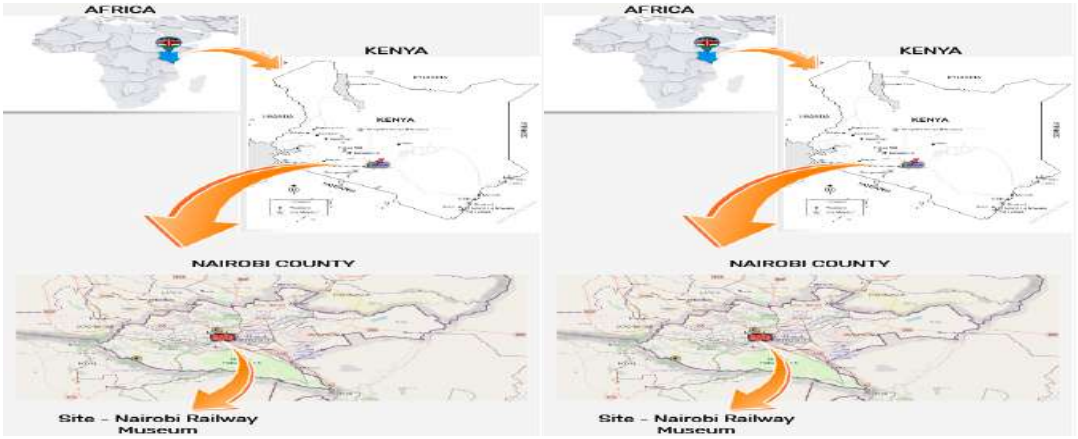


Figure 1: Project Site. Source : Adapted from Adobe Stock, 2024; Bonaita L. (2015, November). *The center-periphery theories in a socio-spatial dimension: A case study of the National Museums of Kenya*.

THE CONCEPT:

Underpinned by the concept of continuity, the design strives to create a harmonious link between infrastructural heritage and cultural narratives. Drawing inspiration from the existing main buildings, the evolution of the form as linear masses on the site is carefully informed. The resultant structure offers diverse vantage points and extends to encompass the existing train tracks

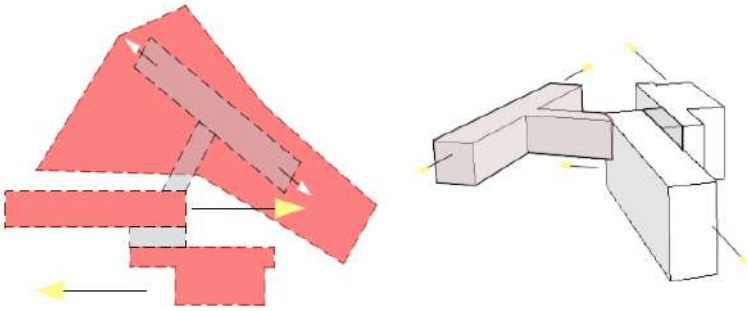


Figure 3: Form Development. Source : Author, 2024.

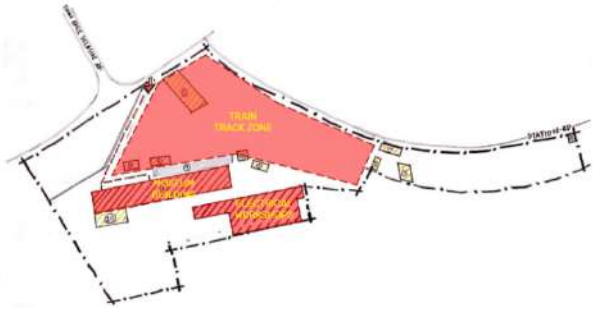


Figure 2: Buildings on site. Source : Author, 2024

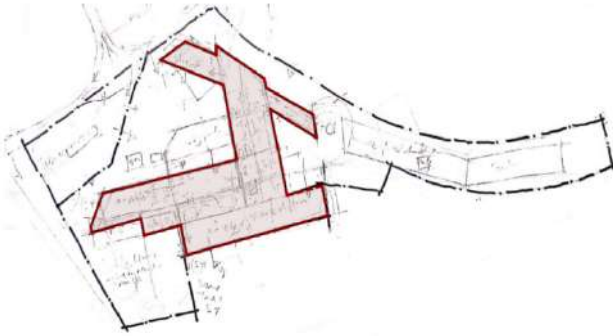


Figure 4: Form Evolution. Source : Author, 2024.

zone for outdoor exhibition. Thus, it is a dynamic element that respects the site's context and architectural vocabulary.

THE DESIGN:

From the conceptual stage, the museum is organized into the following four primary functional zones: exhibition, social, circulation and service. The exhibition zone is given priority as it is the core function of the museum. The layout ensures a clear distinction between areas for visitors and those for staff. This facilitates smooth traffic flow throughout the museum.

Figure 5: Site approach from the parking area. Source : Author, 2024.

Various spaces have been added to the museum complex to facilitate its seamless operation as a unified entity and enhance vibrancy while maximizing the utilization of the site. These include parking areas, an entry plaza, waiting lounges, offices, a repository, a library, research rooms, meeting and conference zones, art workshops, multi-level exhibition galleries and outdoor exhibition and spaces for pop-up events.

The building materials selected for various areas are chosen for their durability and aesthetic appeal. They serve to craft distinct atmospheres within the museum. These materials include epoxy, polished concrete, laminate and vinyl-plank flooring. For the exteriors, masonry walling painted in shades of grey is used. Black and white colours are employed to evoke an industrial look, typical of the industrial museum style. Reinforced concrete pillars support the suspended galleries, with linear design elements prominently featured throughout.

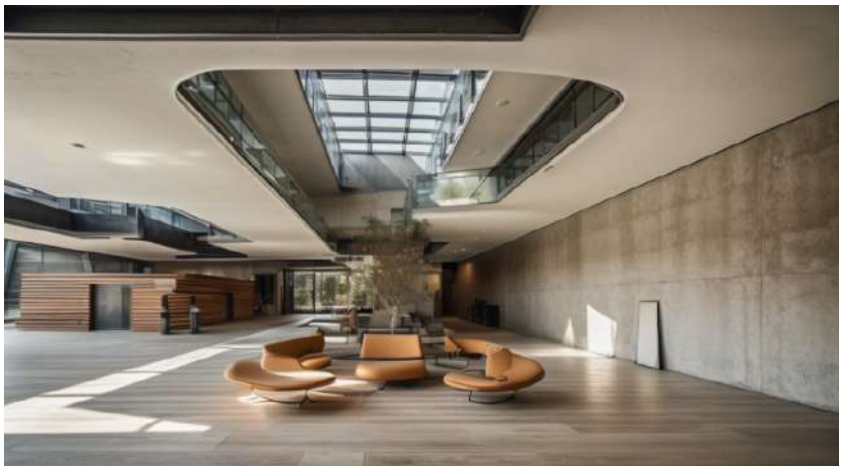


Figure 6: Waiting lounge lit by atrium. Source : Author, 2024.

Figure 7; Site approach from Haile Selassie Avenue. Source : Author, 2024.

This Indo-cultural Museum aims to highlight the continued importance of infrastructural heritage in Kenya, stressing its essential role in shaping national identity. It advocates for the recognition and preservation of this heritage, as its loss would erode a key element of the nation's collective identity and deprive future generations of valuable insights into Kenya's history.

ROLE OF ARCHITECTURAL DESIGN IN ENHANCING EFFICIENCY IN URBAN INTERCHANGES WITHIN NAIROBI CITY COUNTY, KENYA.

Researcher: Kelvin Gicheha Gachwe, B.Arch. Studies. Hons., 2023/4, DAID, SEA, KU, Kenyatta University, gichehagachwe021@gmail.com

Supervisor: Aidah Munano, CBS, Lecturer, DAID, SEA, KU, Kenyatta University, munano.aidah@ku.ac.ke

SDG 11: Sustainable Cities and Communities/**A-2063 G10:** World Class Infrastructure criss-crosses Africa

SDG11 Theme: Inclusive, safe, resilient, and sustainable cities and human settlements/**A-2063 G10 Theme:** World Class Infrastructure criss-crosses Africa.

Sub-theme: Communications and Infrastructure Connectivity

Alignment to Vision 2030:

This study with its avowed interest to attain efficient interchanges, is anchored on the foundation 3.4 of the vision 2030. This foundation proposes that the highest priority be accorded to investment in infrastructure. It is driven by the aspiration of building a country that is firmly interconnected through a network of infrastructure. These include roads, railways, ports, airports, water and sanitation facilities, and telecommunications.

Alignment to NACRA:

This research also aligns with the specific technical discipline of the National Construction Research Agenda (NACRA) (4) on risk and safety management, particularly research area 19. Consistent with the focus of the inquiry, this research area prioritises the maintenance and functionality of construction products, including infrastructure and buildings. More particularly, goal (a) of this research area seeks to evaluate the suitability, convenience, comfort, and functionality of these construction products, especially for individuals with physical disabilities and the elderly.

BIOGRAPHY:

Kelvin is a graduate architect of the Department of Architecture and Design (DAID), Kenyatta University's. He is an active member of AAK. While in the university, he served as an academic secretary for the ASA-KU and class representative. His dedication to excellence earned him runner-up recognition at the Crown Paints Awards of 2023 and fourth place in a regular

departmental design competition. Kelvin has gained experience in both private and public sectors, having worked with Habitech Consultants, Pankin-House Ltd, and the National Housing Corporation. His research interest is on enhancing functionality and user experience in institutional and civic buildings. Further, he is passionate about integrating technology into design and construction workflows.

ABSTRACT:

This study sought to establish architectural design could improve efficiency of use in urban interchanges within Nairobi, Kenya. The Nairobi Integrated Urban Development Master Plan identifies the city's inefficient transportation system as a major obstacle to achieving Vision 2030 in Nairobi city. It designates intermodal urban interchanges to alleviate traffic congestion. Acceptance of Intermodality, depends on the efficiency and attractiveness of facilities for mobility to users. This research focused on identifying effective design approaches that would make urban interchanges functional and appealing. Such interchanges would then aid in decongesting the Central Business District and facilitating seamless city access. The study analysed urban interchange efficiency from two main perspectives, transfer time and quality of dwelling time. From review of literature, it emerged that key architectural factors that affect transfer time include modal choice, spatial compactness, wayfinding, quality of movement, and accessibility for the elderly and disabled. The quality of dwelling time in turn is influenced by the presence of facilities and amenities, indoor environmental quality, and local place identity in design. Safety and security are essential elements for both perspectives. The study employed a case study approach, focusing on purposively selected urban interchanges in both central and suburban Nairobi. It utilized expert key informant interviews to identify parameters and strategies for optimizing efficiency through design, alongside on-site observations and secondary data analysis to evaluate current spatial and physical conditions. It was established that while Nairobi's interchanges incorporated various design strategies for functional mobility and user experience, further improvements were necessary. Retrofitting and expanding facilities for sustainable mobility modes was recommended. This would enhance wayfinding and integrate commercial and recreational spaces to better serve both travellers and the community.

KEY WORDS: Intermodality, sustainable mobility, user experience.

DESIGN PROJECT DESCRIPTION: EXPANSION AND MODERNIZATION OF THE NAIROBI CENTRAL STATION

THE PROJECT SITE:

The Nairobi Central Station redevelopment and modernization project was situated on a 35.6-acre site within the Nairobi CBD, with its strategic location designed to position the station as a vital gateway

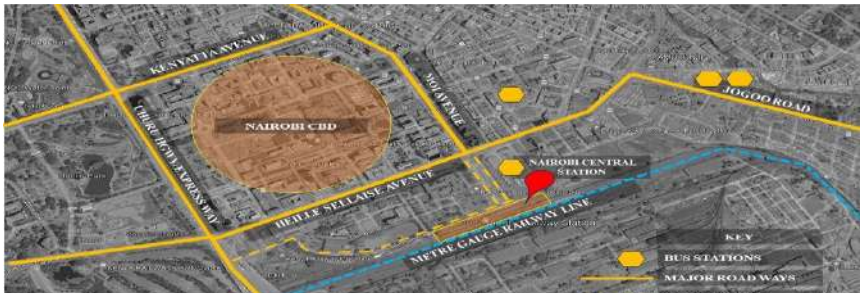


Figure 1: Project site. Source: Adapted from https://www.google.com/maps/search/NAIROBI+CENTRAL+STATION/, 2024

to the city. Connectivity for up to 30,000 daily commuters was intended to be enhanced through the integration of various transportation modes, including commuter railways, buses, matatus, walking paths, and taxis.

THE CONCEPT:

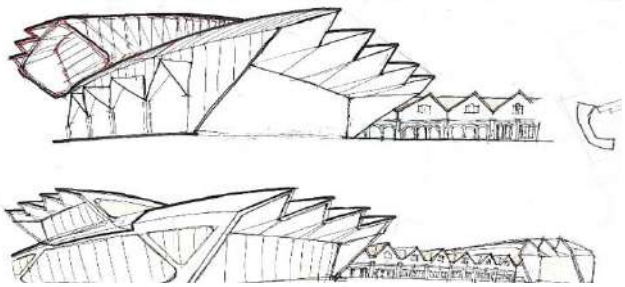


Figure 2: Conceptual sketches of integrating the heritage railway station building with the proposed extension: Source: Adapted from Kenya Railways Corporation, 2024.

The project was guided by the "dynamic continuum" design philosophy, where contemporary architectural elements were merged with the historical significance of the existing heritage building, repurposed as a museum. This approach was implemented to foster a dynamic interplay between the past and present, enriching the station's identity while promoting a strong sense of place. Station efficiency, community engagement, and cultural preservation were enhanced through this type of architectural design.

Design strategies:

A transportation node

As a transportation hub, the station was designed to compactly integrate various modes of transport, with a focus on sustainable options such as active mobility and Bus Rapid Transit (BRT). Design strategies were implemented to minimize intermodal transfer times, ensuring smooth and efficient connectivity. Concourse areas were designed to include comfortable waiting zones, children's play areas, and ticketing facilities. Effective wayfinding was achieved through strategic lighting, the use of accent materials, and the incorporation of public art. An office tower was included in the design to support the operations of the station and also house the transportation agencies of government. Additional rentable spaces were provided to boost the economic viability of the project.

Figure 3: Concourse interior: Source: Author, 2024.

Figure 4: Approach to station: Source: Author, 2024.

A memorable place

The station was envisioned not only as a transportation hub but also as a memorable community space. Commercial spaces, including an anchor store and rentable retail stalls, were integrated to support local businesses. Cultural and recreational amenities, such as a public outdoor amphitheatre, a multifunctional auditorium, food courts, and indoor gaming areas, were incorporated to provide spaces for cultural expression and leisure activities. These

facilities were designed to serve both travellers and locals, with short-stay accommodation and co-working spaces. All these were strategically positioned to avoid obstructing passenger routes, ensuring seamless movement throughout the station.

Figure 5: General view of the station complex showcasing the architectural blend of the heritage building with contemporary additions and public realm.: Source: Author, 2024.

VERTICAL IDENTITY: EXPLORING NAIROBI'S SKYSCRAPERS THROUGH THE LENS OF CRITICAL REGIONALISM.

Researcher: Gregory Ng'etich, B.Arch. Studies. Hons, 2023/24, KU, gregorykipruto@gmail.com

Supervisor: Arch Moses K. Gathua, Director in charge, Anwani Architects, Lecturer KU at DAID. gathua.moses@ku.ac.ke

SDG 11: Habitable Cities/**A-2063 G1:** Modern Affordable habitats and quality basic services.

Sub-Theme: Habitable Working Environments in Urban Areas

Alignment to Vision 2030: The study advocated for designs that respect local traditions and contexts by incorporating the principles of critical regionalism in the urbanscape. To this extent then, the study, was premised on the social pillar of vision 2030 that seeks to attain a just and cohesive society, enjoying equitable social development in a clean and secure environment. More specifically the study was nested in the social strategy 5 of investing in the people of Kenya. Within this context, it found relevance in the sub-strategy 5.5 on housing and urbanization where developing effective capacity for regional and urban development planning is emphasized. Of specific importance here is the knowledge of the value of a cultural identity in cityscapes for blending globalization with Kenya's diverse, integrated, rich cultural heritage.

Alignment to NACRA: Research here also embraced research in the specific technical disciplines of the National Construction Research Agenda (NACRA) (5) on Environment. Here the research area (23) dovetailed well with the focus of inquiry in its concern for emerging trends that related to climate change resilience like smart cities, railway cities, university cities, green buildings and intelligent buildings. Of more specific interest was the objective (b) with an interest to determine the impact of landscaping activities on the air circulation, sound quality and visual aesthetics.

BIOGRAPHY:

Gregory Ng'etich is a graduate Architect of Kenyatta University with notable creativity, dedication and leadership attributes. He is a fervent advocate for sustainable architecture, and actively participates in community projects, aiming to create spaces that are not only functional but also, environmentally conscious and culturally resonant. His designs reinforce the belief that architecture should serve the people and reflect the unique character of its surroundings. Gregory's academic journey at Kenyatta University blended of rigorous study, creative exploration and a steadfast commitment to making a positive difference through design.

ABSTRACT:

This research addressed the profound transformation of Nairobi's skyline and urban fabric occasioned by a surge in skyscraper construction. It emphasized inquiry into the influence of this skyline on the regional character and cultural identity of the city. The study aspired to bridge the

gap in research of scanty information on the cultural significance of skyscrapers and their contextual response within the framework of critical regionalism. The integration of globalization, urbanism and critical regionalism provides a comprehensive framework for understanding the evolving nature of Nairobi's skyline. A combination of the qualitative sample survey and observation methods of research was applied on judgmentally selected case studies here. Field access was aided by the use of questionnaires and structured interview schedules. These were complemented with annotated checklists, sketches and photography. A descriptive data analysis was relied upon to bring out trends and patterns that were sought for. The findings underscored the importance of adopting a more inclusive approach to skyscraper design that incorporates a variety of perspectives, including those of the general public, in discussions about urban identity. The results of the study suggest that architects have a strong comprehension of the subject matter, with contextual response emerging as the principle that is considered the most frequently. The absence of a distinct cultural identity, on the other hand, as well as the conflict that exists between global aspirations and local individuality, both give rise to concerns that need attention. Combining economic viability with cultural sensitivity, implementation of collaborative projects, and the incorporation of a culture of criticism and peer review within the industry were identified as useful strategies for enhancing the incorporation of essential principles of critical regionalism. These will foster engagement of public perspectives and engender adaption of new trends to redefine the skyscraper architecture in Nairobi and transform skyscrapers into symbols of progress, identity and inclusivity.

KEY WORDS: Skyscrapers, Cultural identity, Critical regionalism, Urban fabric, Nairobi Skyline.

DESIGN PROJECT DESCRIPTION: DESIGN OF A CONFERENCE CENTRE - SKYSCAPE SUMMIT

PROJECT BRIEF:

Figure 1: Site location. Source: Author, 2024: Adapted and modified from Google Earth https://earth.google.com/web/@-1.30790845,36.81226616,1685.60884382a,8086.99817405d,35y,0h,0t,0r/data=CgRCAggBOgMKATBKDQj_____8BEAA,

As Nairobi solidifies its position as a key economic hub for East Africa, the city's skyline has experienced rapid transformation, largely driven by the increasing demand for modern commercial spaces. The Skyscape Summit was conceived as a response to this demand. It aimed to provide state-of-the-art facilities for a diverse range of businesses while contributing significantly to the city's architectural identity. The project explored the intersection of globalization, urbanism, and critical regionalism, analysing how these factors influence skyscraper design and its impact on Nairobi's cultural and urban fabric. By examining the cultural significance of skyscrapers

and their contextual response, it aimed to develop a design that not only met economic needs but also respected and enhanced Nairobi's regional character. The design also addressed the challenges of incorporating critical regionalism into contemporary skyscraper design. To this extent, it proposed strategies for a balanced approach that honoured both the economic vitality and cultural heritage of the city. The Skyscape Summit was envisioned as a landmark that goes beyond its functional role, serving as a symbol of Nairobi's growth and as a reflection of its evolving identity. The design advocates for a more inclusive design process that considers public perspectives in shaping the urban environment. Ultimately, such an approach contributes to a more cohesive and culturally resonant cityscape.

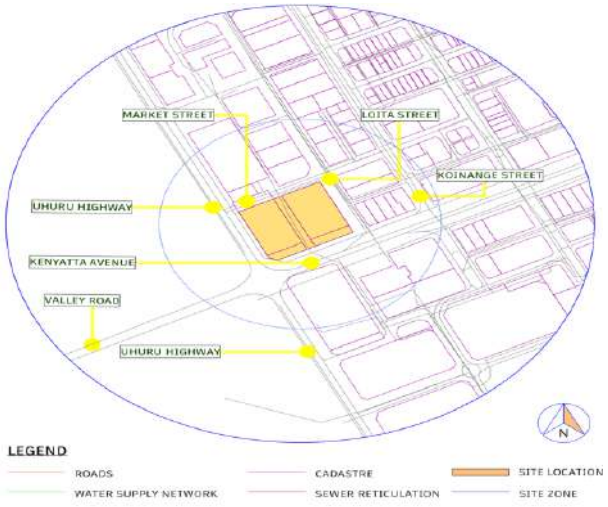


Figure 2: Site context. Source: Author, 2024: Adapted and modified from Google Earth https://earth.google.com/web/@-1.30790845,36.81226616,1685.60884382a,8086.99817405d,35y,0h,0t,0r/data=CgRCAggBOgMKATBKDQj_____8BEAA, ©2024 Google

THE SITE: The chosen location is ideally situated in the center of Nairobi's commercial sector. It is a prominent and accessible location for a commercial skyscraper because it is surrounded by two prominent major highways, uhuru highway and the expressway. It is close to conspicuous landmarks such as the Kipande house. The site is located right at the periphery of the Nairobi CBD built up area and acts as a critical node for daily commuters within the Nairobi CBD. Nairobi, as Kenya's capital and a thriving regional economic hub, presents a unique set of challenges and opportunities. The city has had a steady growth since the early 21st Century. However, there has been an unprecedented city growth in the last 20 years, and this has led to a necessary review of some zoning regulations. Appropriate infrastructural support is also crucial for the project's success.

THE CONCEPT:

The design of the Skyscape Summit, a proposed skyscraper in Nairobi's Central Business District (CBD), serves as a critical exploration of the principles of Critical Regionalism in high-rise architecture. This design emphasized tectonic expression, genius loci, and critical engagement. It aimed to create a structure that was deeply rooted in Nairobi's cultural and environmental context. By integrating traditional architectural

Figure 3: Exterior perspective of skyscape summit showcasing the exterior form with the interplay of stone, glass and steel. Source: Author, 2024.

elements, local building materials, and sustainable design practices, the Skyscape Summit design sought to align with and enhance the city's unique identity. The design process focused on balancing the forces of globalization with local cultural narratives. This ensured that the Skyscape Summit not only contributed to Nairobi's evolving skyline but also reflected and reinforced the cultural and urban fabric of the city. The design highlights the significance of creating skyscrapers that resonate with the local genius loci, addressing contemporary urban challenges while maintaining architectural innovation. In the long run, the Skyscape Summit will stand as a model for how critical regionalism can guide the creation of skyscrapers that are contextually relevant and architecturally significant, thereby strengthening Nairobi's identity in a rapidly globalizing world.

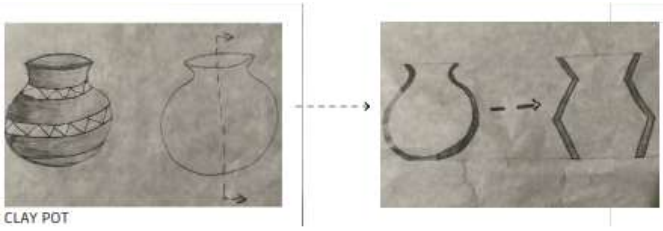
THE DESIGN:

Tectonic Expression:

Figure 4: Exterior Perspective showing the interplay of different materials and form on a building's facade. Source: Author, 2024.

In the design of Skyscape Summit, tectonic expression is manifested through the deliberate use of local materials and construction techniques that reflect Nairobi's cultural and environmental context. The building's structural form is inspired by traditional Kenyan architecture, reinterpreting vernacular techniques in a modern high-rise format. This approach not only ensures that the skyscraper resonates with the local aesthetic but also emphasizes the craftsmanship and materiality that are central to critical regionalism. The façade, for example, incorporates locally sourced stone and timber, creating a visual dialogue between the building and its surroundings. This tectonic approach fosters a connection between the structure and the local context, ensuring that the Skyscape Summit is both innovative and rooted in its environment.

Genius Loci:



Figures 5 & 6: Conceptual sketches. Source: Author, 2024.

The design of the Skyscape Summit's was deeply informed by the concept of genius loci, or the spirit of the place. The orientation, massing, and spatial organization of the building were all carefully considered to respond to Nairobi's unique urban and cultural landscape. The design integrated elements of the local climate, such as natural ventilation and sun shading. This was done in order to create a building that was both environmentally responsive and attuned to the local way of life. Public spaces within the building were designed to reflect Nairobi's vibrant street culture, fostering a sense of community and engagement. By embedding these characteristics into the design, the

Skyscape Summit honoured and amplified the intrinsic qualities of its location, making it a true reflection of the urban spirit of the city of Nairobi.

Figure 7: Contextual render of skyscape summit. Source: Author, 2024.

Critical Engagement:

The design of the Skyscape Summit embodied critical engagement by actively responding to both global architectural trends and local cultural narratives. This skyscraper did not merely impose a universal design language onto Nairobi's skyline, instead, it critically engaged with the city's historical and cultural context, incorporating design elements, such as form, that spoke to the identity of Nairobi while addressing modern needs. The design challenged the homogenizing effects of globalization by embedding local traditions and values into the skyscraper's form and function. Additionally, it engaged with the community through public spaces and cultural programmes, ensuring that the building was not an isolated landmark but rather a living part of the social fabric of the city. This critical approach ensured that the Skyscape Summit was both a product of its time and a contributor to the ongoing narrative of the development of the city of Nairobi.

A STUDY OF LUO TRADITIONAL ARCHITECTURE AND ITS POTENTIAL IN THE HOSPITALITY INDUSTRY AROUND LAKE VICTORIA IN KENYA.

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Supervisor: Arch Alfred Odhiambo Omenya (PHD), Professor of Architecture and Planning, DAID SEA, KU
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SDG 11: Sustainable Cities and Communities/**A-2063 G16**: African cultural renaissance is pre-eminent.

SDG 11 Theme: Strengthen efforts to protect and safeguard the world's cultural and natural heritage/**A-2063 G16 Theme:** Cultural heritage, creative arts, and businesses.

Sub-theme: Revival of traditional architecture, owing to its cultural identity and aspects of sustainability.

Alignment to Vision 2030: This inquiry promotes eco-tourism and local craftsmanship thereby generating income and employment. Such a focus places the study well within the economic pillar in the domain of its economic vision and strategy which advocates for value addition to Kenyan products and services. Of critical relevance is the declared goal to promote tourism (4.1) with an aim to place Kenya among the top 10 long-haul tourist destinations in the world. In this context, Kenyan tourism would offer a high-end, diverse and distinctive visitor experience that few of her competitors can match. Specific strategies in this goal that relate to this study, include creating new high-niche products such as cultural, eco-sports and water-based tourism.

Alignment to NACRA: This inquiry fits into the specific technical discipline of the National Construction Research Agenda (NACRA) (1) construction technology and materials. It contributes to research area (1) on suitability and adoption of local/indigenous construction materials. Specific relevance obtains from objective (b) of this research area, that seeks to establish the suitability of the indigenous vernacular/cultural construction materials such as makuti, thatch, mud (Maasai hut), volcanic ash, quarry dust and white coral stones.

BIOGRAPHY:

Mary Goretty Akoth, is a graduate student of the Department of Architecture and Interior Design (DAID), Kenyatta University. She underwent a transformative period of skill refinement at Emacs Cad Solutions Architects. Her fervent dedication lies in the preservation of traditional architecture, a realm she believes embodies profound essence for sustainability and cultural qualities that are currently imperilled by the encroachment of modernism within the construction sphere. Mary's unwavering commitment resonates through her work as she ardently strives to protect and promote these invaluable facets, that safeguard a legacy for posterity.

ABSTRACT:

Traditional architecture embodies profound cultural significance and values that modernity often lacks. It therefore serves as an important reflection of heritage and identity. However, globalization poses a grave threat to these time honoured architectural styles, to the extent of risking their gradual disappearance. This research focuses on reviving Luo traditional architecture in Kenya, emphasizing its authenticity devoid of modern influences. The theoretical framework of this study is grounded on vernacular architecture contextualism theory, cultural homogenization theory, cultural imperialism theory, and critical regionalism.

The field research employed participant observation and focused as well as individual interviews. Observation of patterns and artifacts was also done with the aid of annotated checklists, sketches, notes and photographs. Data was collected from Luo traditional homesteads in Kisumu and Thimlich Ohinga, including the Thimlich Ohinga Fortress walls, and Kit Mikayi Luo historical stone structures. The potential of Luo traditional architecture was exemplified through the case study of Rusinga Island Lodge. All sites for data collection were selected through purposive sampling for their ability to provide articulate and complete information. Qualitative thematic and descriptive analysis of the information gathered was thereby assured. This approach and methodology was useful for identifying trends and patterns in the spaces and buildings that were examined here.

The study findings the showed a deep-rooted symbolism that was embedded within Luo traditional architecture, offering a profound sense of cultural identity. Noteworthy was the prevalent use of traditional construction materials such as wood, mud, thatch, and stone, each carrying its distinctive significance. Moreover, intricate traditional construction techniques like wattle and daub, alongside skilful weaving methods for reeds, were uncovered. Prevalent use of round forms that symbolised unity in the Luo tradition was also recognized. While uncovering how Luo traditional architecture has manifested in the hospitality industry around Lake Victoria, the Rusinga Island lodge came out strong, as it manifestly exemplified good use of Luo traditional construction materials and techniques. The study recommended active advocacy for and practice of the revitalization and preservation of traditional architecture. Through such endeavours it would be possible to safeguard cultural heritage, authenticity, and retain a poignant link to bygone eras. The enduring value of traditional architectural forms as resilient guardians of cultural legacy amid the sweeping tide of globalization could be in this way accentuated..

KEY WORDS: Traditional architecture, globalization, cultural identity, sustainability, Materiality, symbolism.

DESIGN PROJECT DESCRIPTION: REDEVELOPMENT OF RUSINGA ISLAND LODGE

PROJECT SITE:

Rusinga Island Lodge is located at the shore of Nam lolwe (Lake Victoria), which is the second largest freshwater lake in the world. Site strengths include close proximity to the lake with unmatched views and cool breeze, ease of accessibility due to presence of road transport-Rusinga Ring road, air transport-Rusinga Lodge airstrip on site, and water transport- through the lake. There are also pre-existing structures which are in alignment with Luo traditional architecture. This makes the site a good choice for a project of Luo traditional architecture.

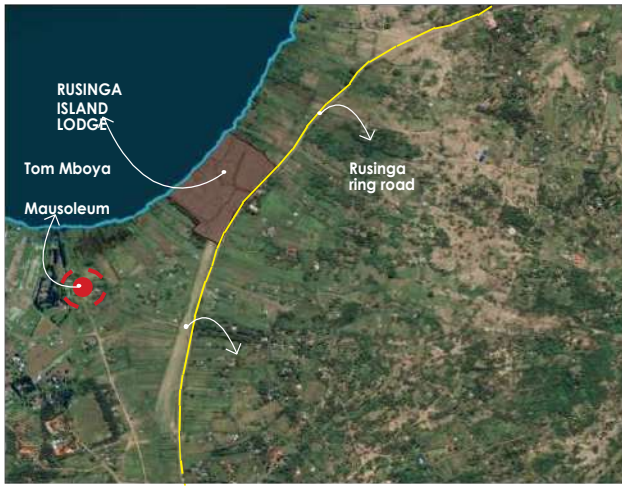

Figure 1: Rusinga Island Lodge. Source: Google Earth, 2023.

THE BRIEF:

The proposed development is grounded on the thought of "Cultural identity''. The existing structures on site include, A restaurant, a separate distant kitchen, a small meeting room of 45 persons capacity, cottages that include, single cottages, family cottages and a presidential cottage. The site also has staff housing and a boat house, a camping site and an airstrip. The project expanded the resort by introducing a conference hall, meeting rooms, a resource centre, a library, and offices for administration. Further it introduced boat cottages that float above the lake and expand the existing restaurant by introducing an attached kitchen and a bar. The newly introduced buildings were fashioned in a manner that ensured a seamless integration with the existing structures while maintaining Luo traditional architecture elements. These included round forms, Luo traditional construction materials (stone, thatch, wood and reeds), Luo traditional construction technologies, planning aspects and concepts and symbolism from the Luo traditional architecture.

Figure 2: Rusinga Island Lodge. Source: Author, 2023.

THE CONCEPT:

The project used the huts arrangement in the Luo traditional homestead to come up with a cluster concept that informed the newly introduced designs as shown in the visual illustrations here below.

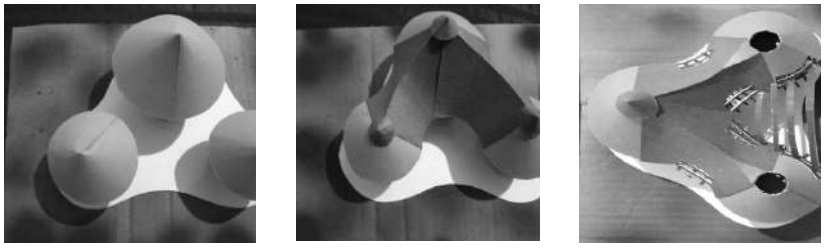

Figure 3: Concept Models. Source: Author, 2024.

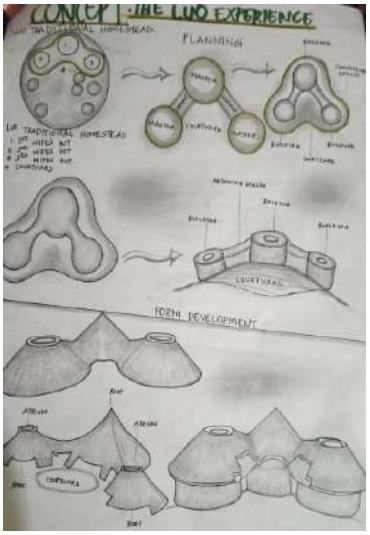

Figure 4: Concept Development. Source: Author, 2024.

Figure 5: Conference Hall Perspective. Source: Author, 2024.

THE DESIGN:

Conference hall

The conference design mimicked a cluster of three traditional Luo huts, showcasing Luo architectural materials like thatched roofs, and stone walls that were inspired by the Thimlich fortress, and natural wood.

Restaurant

The restaurant expansion included a bar in one wing, a kitchen in another, and an outdoor dining area in the courtyard. This design integrated seamlessly with the Luo hut cluster concept. It also featured traditional Luo construction materials.

Boat cottages:

The boat cottages incorporated traditional Luo architectural materials and a flood-conscious design that ensured sustainability.

Figure 6: Restaurant Construction Materials. Source: Author, 2024.

Figure 7: Redeveloped Restaurant. Source: Author, 2024.

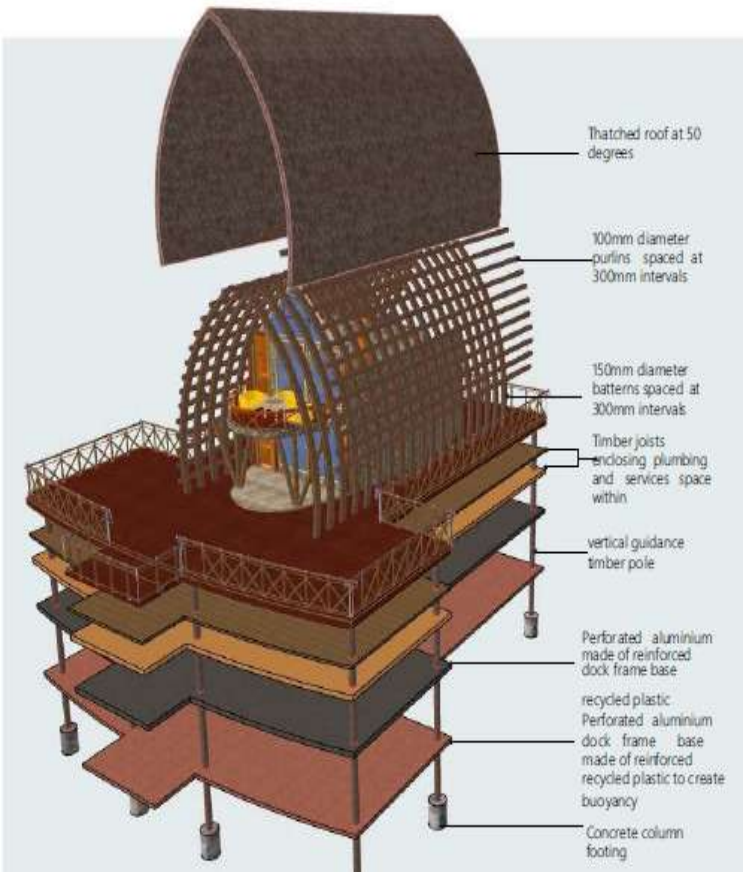

Figure 8: Boat Cottages Construction Materials. Source: Author, 2024.

Figure 9: Existing Restaurant: Source: Author, 2024.

Figure 10: Boat Cottages. Source: Author, 2024.

The cottages on pilotis that were introduced in this project could float during floods. They were also easily relocatable. They featured sloped roofs for drainage and treated woo
den platforms to resist water damage as shown in the illustation here below.

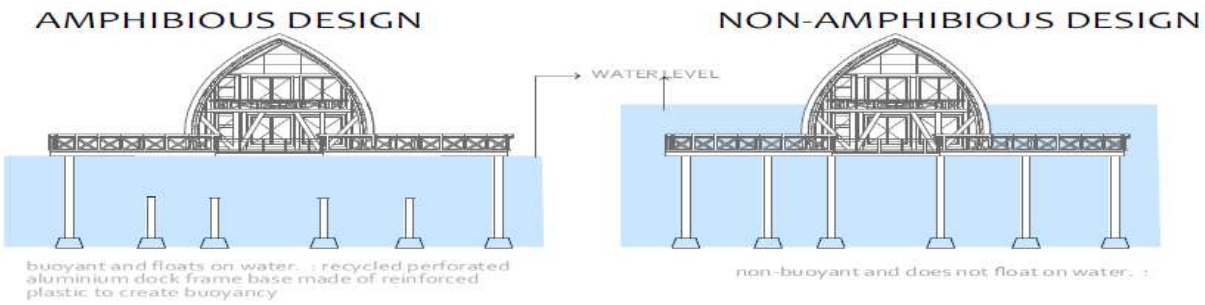

Figure 11 & 12 Amphibious and non-amphibious designs. Source: Author, 2024.

ATRIA FOR DAYLIGHTING IN DEEP PLAN BUILDINGS-A CASE OF OFFICE SPACES IN NAIROBI CITY COUNTY, KENYA.

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Supervisor: Arch. Eric Olugi Juma, Lecturer DAID, KU, juma.eric@ku.ac.ke

SDG 11: Sustainable cities/**A-2063 G1:** A high standard of living, quality of life and wellbeing for all citizens.

SDG 11 theme: Habitable cities/**A-2063 G1 Theme:** Modern, affordable, and liveable habitats and quality basic services.

Sub theme: Habitable working environments in urban areas

Alignment to Vision 2030:

The research is aligned with Kenya Vision 2030's social pillar of a just and cohesive society, enjoying equitable social development in a clean and secure environment. It encompasses policy 3.6 of Science, Technology and Innovation (STI) recognizing the role played by product manufacturers in creating products that create environmentally friendly spaces. The study contributes to social strategy 5.4 of the environment aiming to lessen emerging environmentally related diseases such as depression that is caused by insufficient daylight. It also contributes to strategy 5.5 of housing and urbanization by ensuring a decent and high quality of urban livelihood.

Alignment to NARCA:

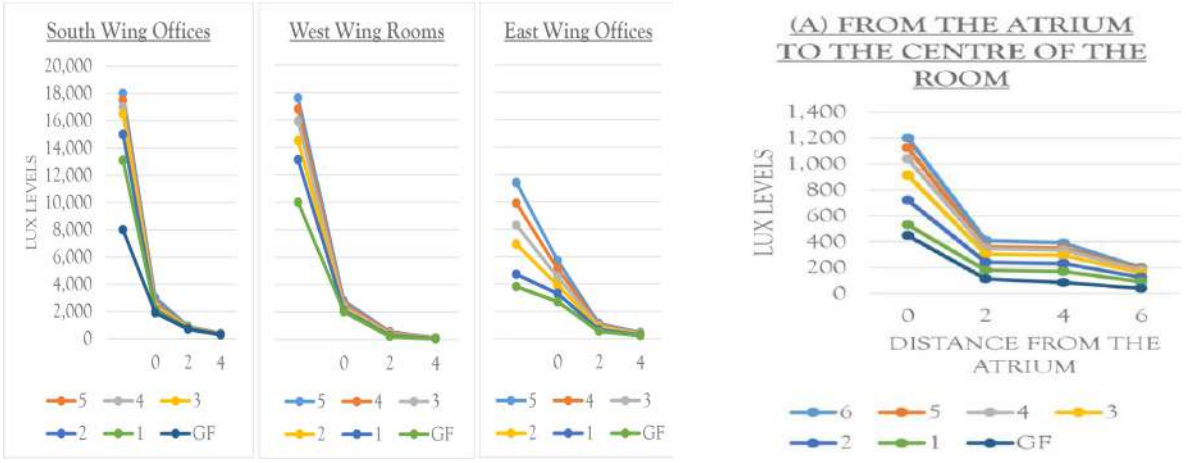
The research is centered on NARCA's discipline 5 on environmental issues under category 23 on emerging trends that relate to climate change resilience like green buildings with an intent to save on energy. Kenya, which heavily relies on hydro power faces uncertainty in its energy reserves due to climate change requiring strategies that improve daylighting to reduce reliance on artificial energy.

BIOGRAPHY:

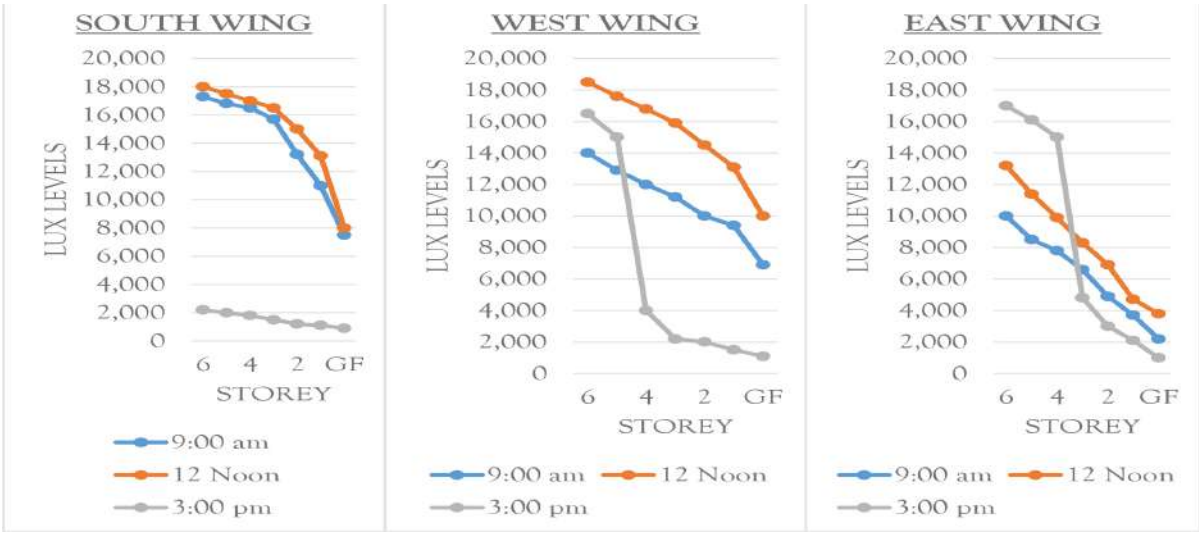
Momanyi is a graduate architect from the Department of Architecture and Interior Design (DAID) of Kenyatta University. He delights in sketching and model making. He has worked in the public sector at Nairobi City Hall and Kenyatta University, gaining skills in drafting and 3D modelling. He participated in inter departmental soccer games and served as the assistant class representative for the 2nd Cohort. As a practitioner, he believes in sustainable hedonism rooted in the belief that architecture is created for human pleasure and that pleasure can never exist without architecture.

ABSTRACT:

The study investigated the use of atria for daylighting in deep floor plates that have a challenge of daylighting. Lighting has been proved to have psychological and physiological benefits. Its absence occasions mental health issue's such as depression. The number of these types of buildings especially in the Nairobi City's Central Business District and its immediate environments is increasing rapidly given the rising land values and the need to maximize development. The study explored the performance of key design parameters of atria for achieving ample daylighting in the adjacent spaces. The parameters under study included the geometry of the void, reflectivity and transmission of materials used, the daylight inlet aperture, the sky view and the sky component. Using the case study method and considering the study's interest in non-polygonal atria, purposive sampling was relied upon to select the central administration complex at Kenyatta University and The One Park along Limuru Road. This choice availed an opportunity to shed more light on the effect of varying Section Aspect Ratio (SAR-ratio of the width to height) and Plan Aspect Ratio (PAR-ratio of the length to the width). Lux levels were measured at different points in the void and the adjacent space at different times of the day. The case studies were probed using the Quan Qual method. It emerged that the varying width of the atria increased the PAR and SAR, reducing the inlet aperture and thereby in turn decreasing the sky component. This lead to lower illumination. The orientation of the atria in relation to the sun determined solar intensity in the void and consequently the illuminance. Higher light transmittance occurred due to a higher window to wall ratio, the use of glass with a high transmittance co-efficient, and the use of highly reflective materials. The high light transmittance was observed to affect reflectivity leading to lower illumination at lower storey levels. The steel profiles on the windows, the drapes on the windows and furniture arrangement inhibited the transmission of light. It was also observed that light will only reach the wall furthest from the atrium if an adequate room index, i.e. the relationship between the window to wall ratio (WWR) and the volume of a room, is observed. Therefore, when designing non polygonal atria, the inlet apertures should be angled and coated with reflective material to enhance illumination while keeping low PAR and SAR levels. Achieving a balance between high light transmittance glass and reflective glass improves light distribution in adjacent spaces.



Figures 1-4: Lux graphs showing illuminance in the void and adjacent spaces at the central administration complex and in One Park Avenue. Source: The author, 2024, measurement on site.



Figures 5-6: Lux graphs showing illuminance in the void and adjacent spaces at the central administration complex and in One Park Avenue. Source: The author, 2024, measurement on site

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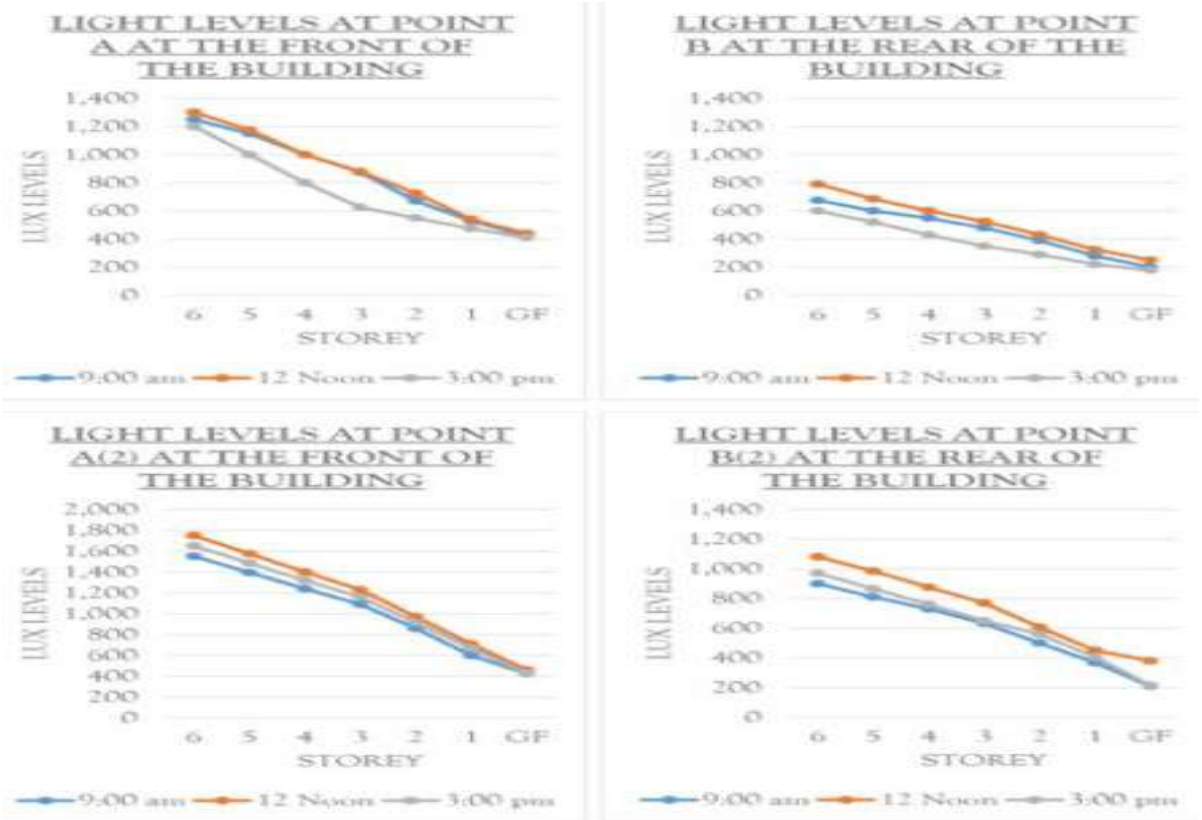


Figures 7-11: Lux graphs showing illuminance in the void and adjacent spaces at the central administration complex and in One Park Avenue. Source: The author, 2024, measurement on site

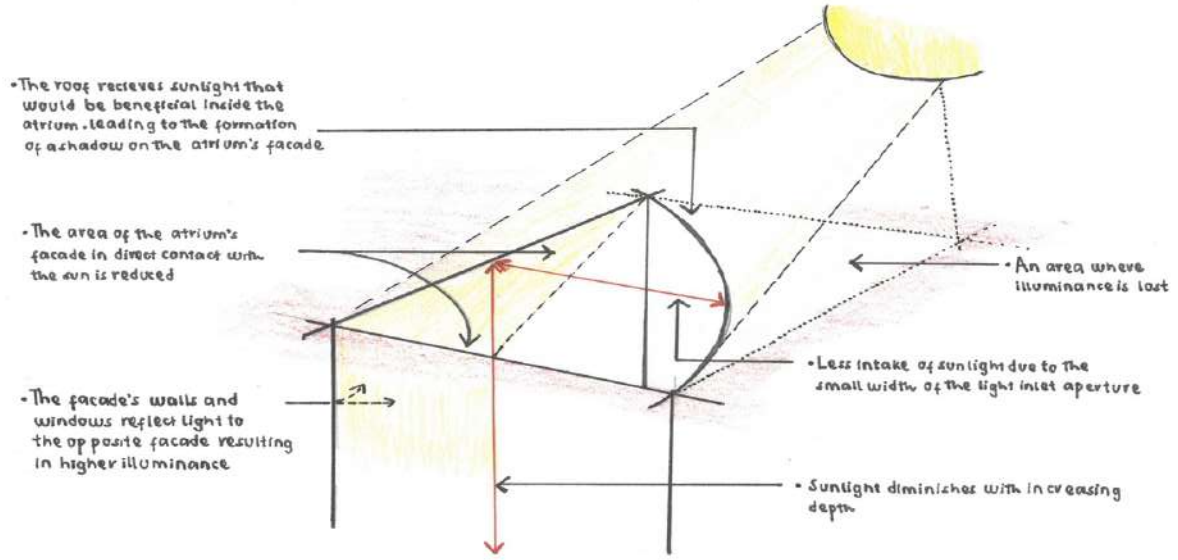


Figure 12: An area of lost illuminance at the inlet aperture when the sun is at an angle leading to low illumination. Source: Author, 2024, abstracted from the building plans by Abbey architects, Kenyatta University, 2023.

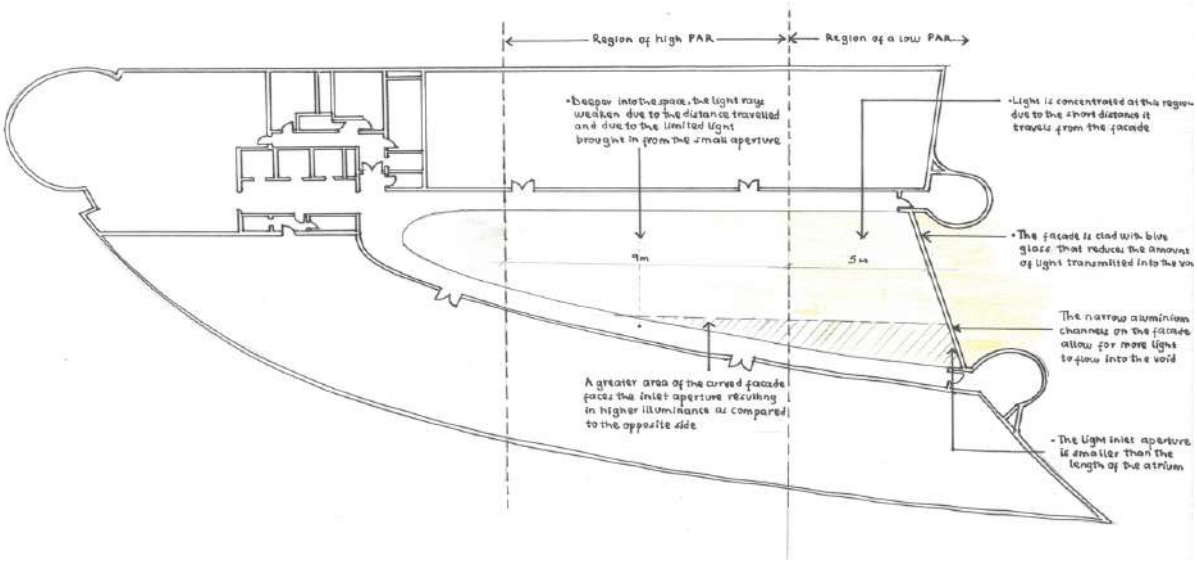


Figure 13: Increase in PAR as a result of longer lengths in the atrium leads to lower illumination. Source: Author, 2024, abstracted from the plans on Knight Frank's website, 2023.

KEY WORDS: Illuminance, Reflectivity, Transmission, Plan Aspect Ratio, Section Aspect Ratio, Room index.

DESIGN PROJECT DESCRIPTION: A COMMERCE HUB FOR SMALL AND MEDIUM SIZED ENTERPRISES (SMES) - 'THE MERCHANT'S HUB' IN NAIROBI CENTRAL BUSINESS DISTRICT.

Figure 14: A physical model of the Merchant's Hub. Source: Author, 2024.

THE PROJECT: The Merchant's hub aims to serve as infrastructure for SMEs, nurturing them into the corporate giants of tomorrow. The project highlights the design considerations of ensuring that this group achieves economic success while working in a habitable environment. To this extent, it integrates a series of atria for lighting purposes.

THE SITE: A 2-acre parcel of land in the heart of Nairobi Central Business district, which is adjacent to Agha Khan Walk was selected for development. It was chosen due to the high foot traffic experienced in the area, which is beneficial for commerce. The cost of land acquisition, urban context and incident zoning policies necessitated a vertical development.

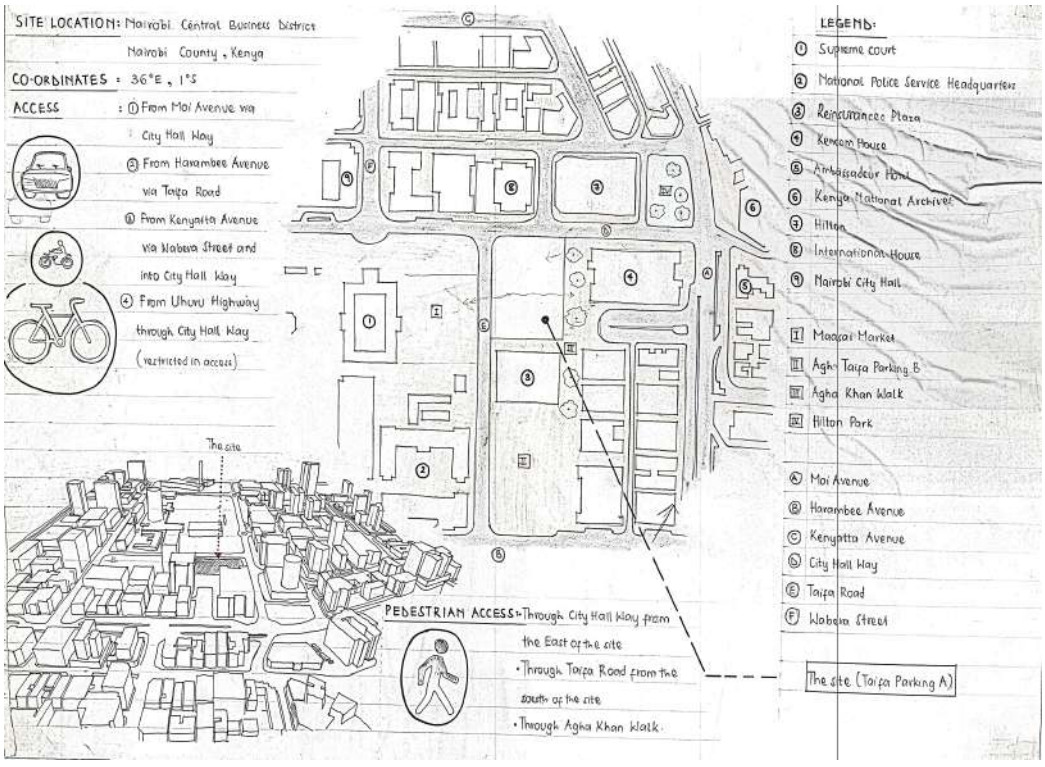


Figure 15: The location of the site. Source: Sketched by the author from Google Earth, 2024.

THE BRIEF: The surrounding land parcels were zoned as institutional, commercial, residential and public use

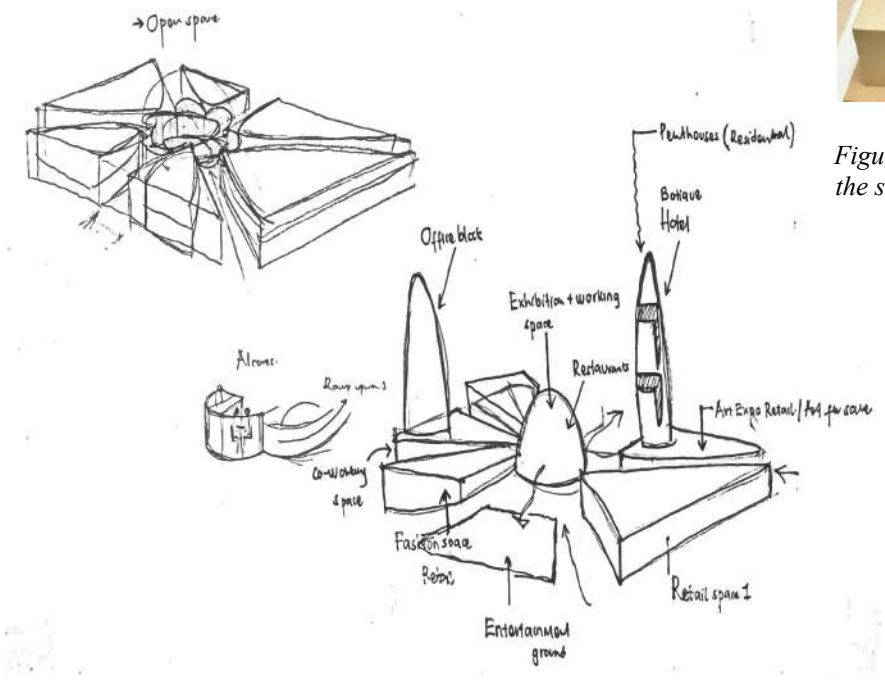
requiring a complementary mix of functions. The development provided parking spaces that are required in town, office and retail spaces. These would meet the space demand for commerce. Residential functions catered for the market for penthouse living in the city center. Hilton and Intercontinental, the two major hotels in the area closed down during the covid-19 period. A hotel would therefore be housed within the development to tap into the hospitality sector. This later function targeted businessmen and companies who require meeting and accommodation spaces.

Figure 16: A physical model showing the proposed and surrounding developments Source: Author, 2024.

THE CONCEPT:

The development was conceived from upcoming vertical cities prominent in large cities world over. In this concept, the possibility of creating a new city within an existing city was explored. The concept of a "city within a city" is a paradigm for

Figure 17: A physical concept model for the scheme. Source: Author, 2024.



Figures 18: Creation of axis, nodes, districts and edges. Source: Author, 2024.

independent developments in urban areas that focuses on economic niches for special developments. This concepts transforms urban living by creating an enclave where diverse functions, green spaces and transport networks converge similarly to the bustling city center. The New urban lifestyle is centered on 'sustainable hedonism' where mindful biophilic spaces for

comfort, working and living are provided with elements that enhance both personal pleasure and planetary health and fitted in within a microcosm. This philosophy holds it that sustainability and indulgence can to co-exist for project success.

The 21-storey mini city mixed use development seamlessly immerses micro, small and medium sized businesses (MSMEs) in the bustling city center using the following five defining elements of urban structure (Kevin Lynch, 1960). First is an axis through the building that improves traffic flow on site. It is lined with stalls for commerce, thereby increasing product visibility. Second is a node set up as a restaurant to draw in traffic. It is adorned with biophilic elements creating a vista

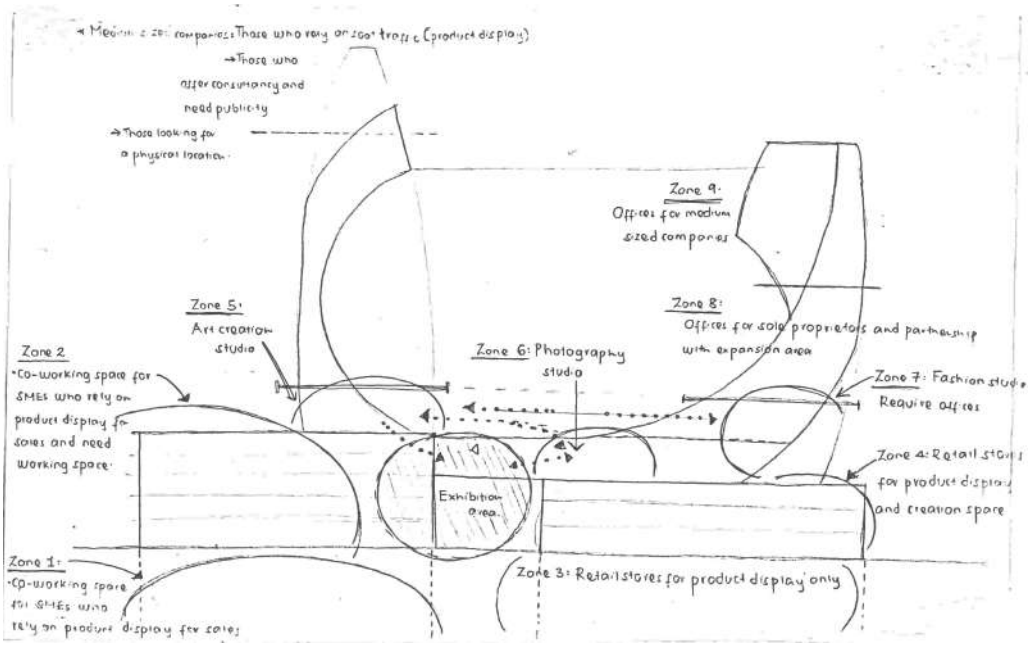


Figure19: Creation of axis, nodes, districts and edges. Source: Author, 2024.

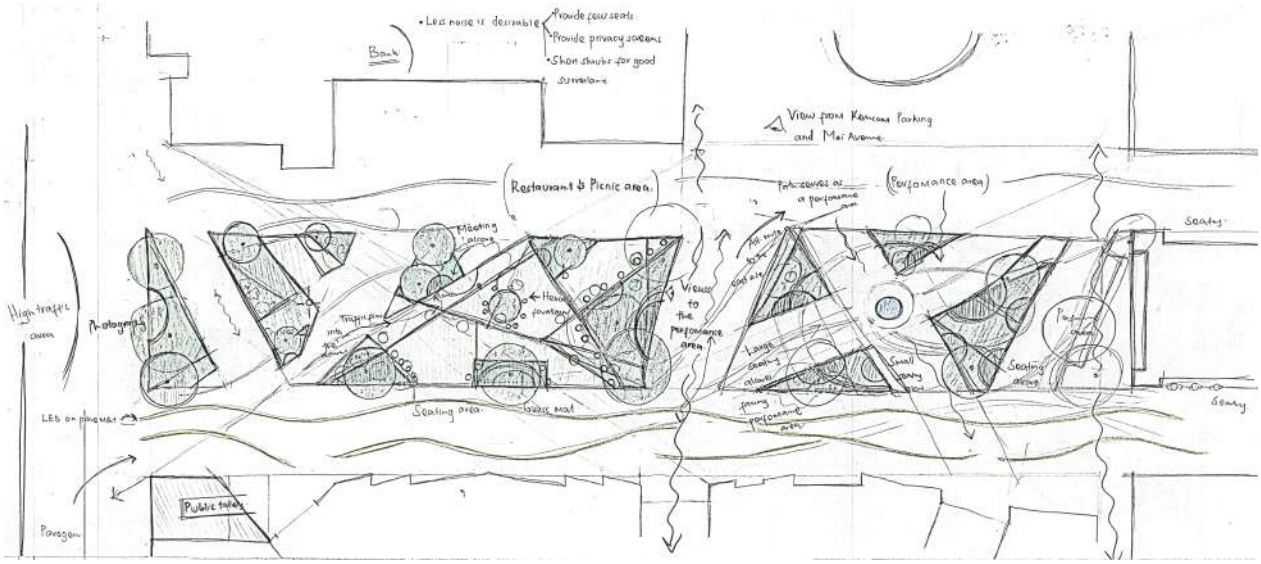
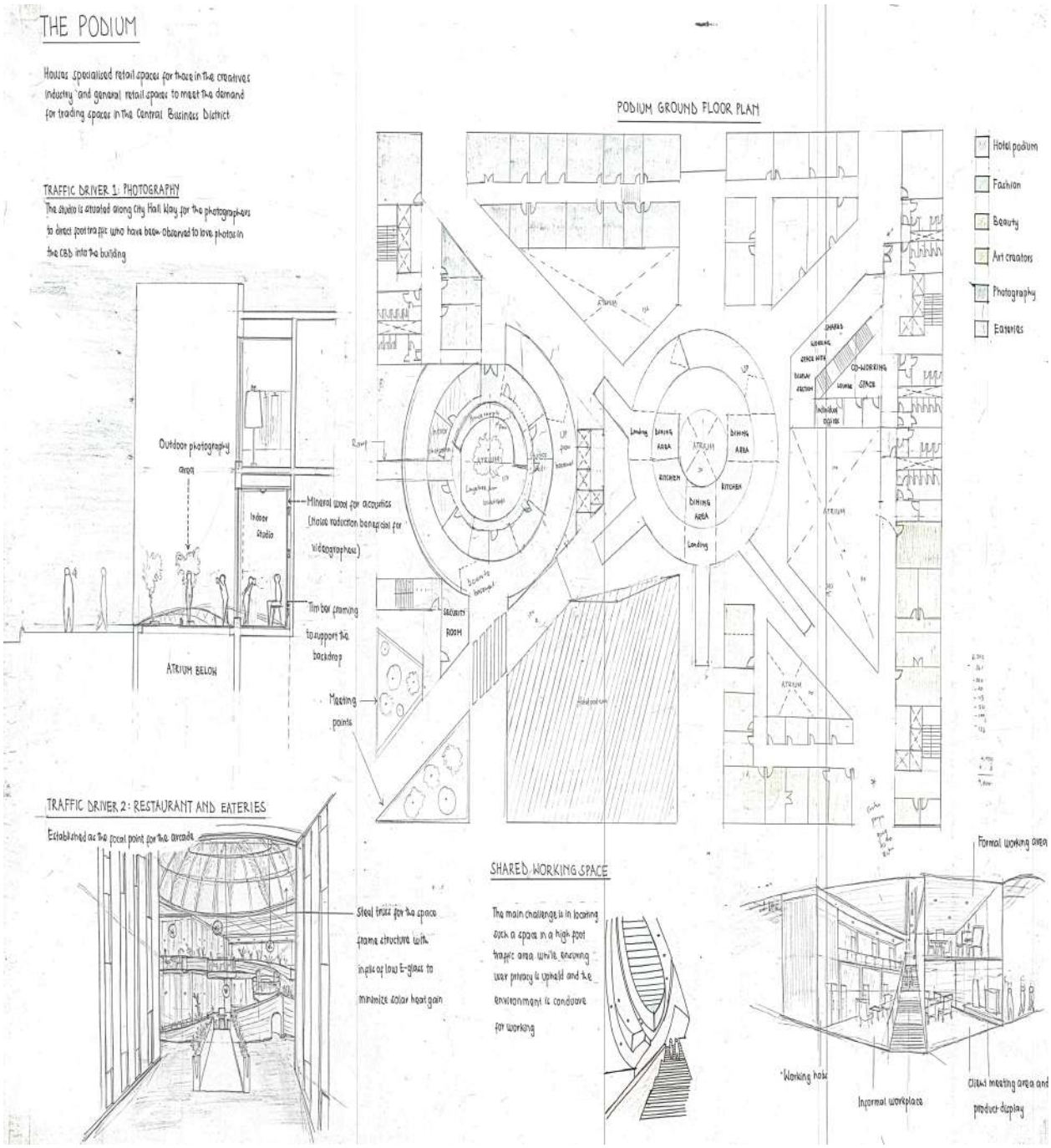


Figure 20: Creation of axis, nodes, districts and edges. Source: Author, 2024.

that attracts more users into the space. Third is the segmented and well-

defined building functions based on the shopping and user preferences of the foot traffic and arranged on a privacy hierarchy. Fourth is a well-defined edge that draws users to and inside the site. Finally, there is the formal yet informal building form that reflects the minimal space consumption in large buildings, and responds to solar exposure, thereby forming a landmark.



Figures 21-24: Ground floor plan layout of the scheme.. Source: Author, 2024.

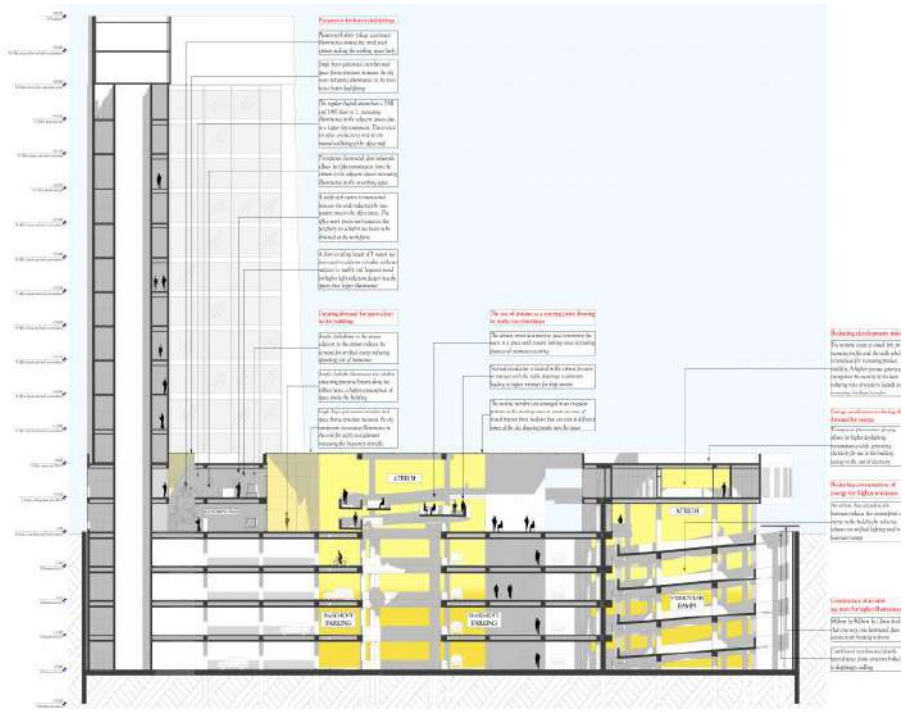


Figure 25: Section showing adequately sized atria. Source; Author, 2024.

THE USE OF ATRIA:

A series of atria were introduced for: (1) aesthetic purposes and at the node in order to connect users of the space with nature; (2) for daylighting in places that conventionally relied on artificial lighting, such as basements; (3) for natural lighting in the office and retail spaces, so as to improve productivity and commerce respectively and (4) for creating a visual link between spaces at the podium level, and thereby increasing product visibility for better sales.

The atria were adequately sized, maintaining a low PAR and SAR thereby increasing daylighting in the void. The sky view factor was kept high by the use of a single layered space frame structure, with thin and narrow RHS members. Due to the expensive nature of the initial costs of sustainability, transparent photovoltaic glass was selected as the covering of the inlet aperture. In this manner, it played a dual role of bringing in

Figure 26: 3D Visualization of the atrium at the podium level and the basement parking. Source, Author, 2024.

daylighting and capturing solar energy for artificial lighting at night.

Figure 27: Interior view of the co-working spaces that is lit by a mini atrium. Source: Author, 2024.

The daylighting levels in the void were therefore higher. For better light transmission into the adjacent spaces, the window to wall ratio was maintained at 100% (1:1) throughout the rentable spaces. The glazing specified as clear view glass has transmits 80% of daylight into the space. This ensured ample light was transmitted into the spaces.

A maximum depth of 5 meters was observed in all the rooms to achieve a low room index ensuring ample daylighting deep into the spaces. In addition, highly reflective porcelain tiles were used to reflect daylighting falling on them into the spaces. The furniture was set a distance away from where the sun rays would land so as to provide wall and floor a surfaces that would initiative internal reflections to catch the light first. Glare was reduced by contrasting highly reflective surfaces with dark finishes such as walnut.

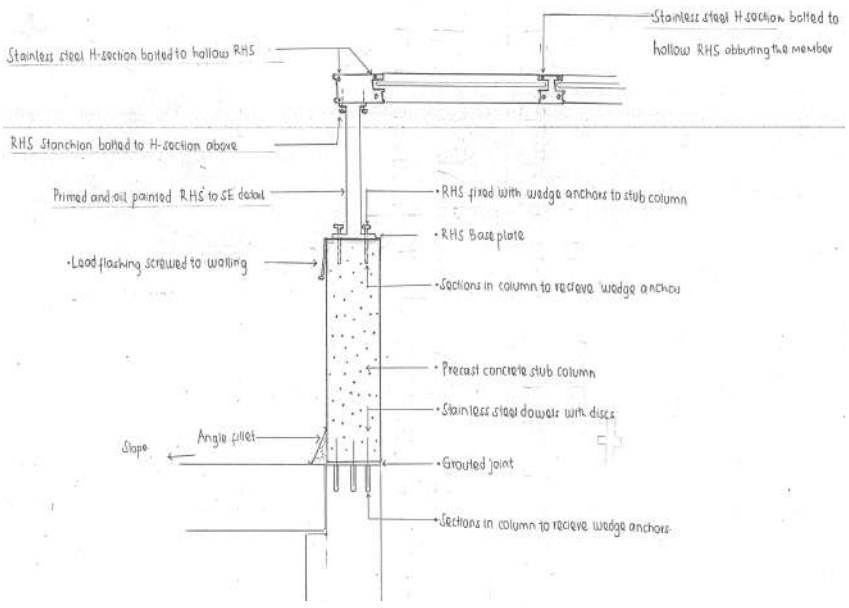


Figure 28: Detail of a single layered space frame structure with clear photovoltaic glass infill panels. Source; Author, 2024.

Sustainable Development Goal 13

Climate Action

Take urgent action to combat climate change and its impacts

Life on Land

Theme:

1.Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

2.Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities.

Agenda 2063 Goal 07

Environmentally sustainable and climate resilient economies and communities

Theme:

1.Climate resilience and natural disasters preparedness

2.Biodiversity, conservation, and sustainable natural resource management

ENVIRONMENTAL DESIGN STRATEGIES FOR LABORATORIES AND WORKSHOPS IN INSTITUTIONS OF HIGHER LEARNING IN NAIROBI CITY COUNTY.

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Supervisor: Arch Alfred Odhiambo Omenya (PHD), Professor of Architecture and Planning, DAID, SEA, KU, alfred.omenya@ku.ac.ke

SDG 13: Climate Action /**A-2063:** Environmentally sustainable and climate resilient economies and communities.

SDG Theme: Take urgent action to combat climate change and its impacts//**A-2063 Theme:** Climate resilience and natural disasters preparedness.

Sub-theme: Climate responsive architecture for institutions of higher learning in Nairobi

Alignment to Vision 2030:

This inquiry embraces Vision 2030's social strategy No 5.4 which aims for a clean, secure and sustainable environment. It equally blends with foundation No 3.5 on encouraging new sources of power such as renewable energy. The socio-economic well-being of Kenya is intertwined with the environment in the economic pillar, aiming to achieve an average Gross Domestic Product (GDP) growth of 10%.

Alignment to NACRA:

Research here aims to promote environmentally friendly construction by embracing research in the National Construction Research Agenda's (NACRA) subject area (5) on Environment, rand its constituent research area 21 with a focus on climate change. Likewise, the related research area 23 that speaks to emerging trends relating to climate change resilience is pertinent here, with its focus on objective "c" on use of renewable energy with its impact on saving on energy.

BIOGRAPHY:

Frankline is a graduate architect of the Department of Architecture and Design (DAID), Kenyatta University. He is a proponent of climate change with an emphasis on the adoption of green energy sources. He has displayed outstanding excellence both individually and as a team player. During his industrial attachment he took up critical roles at Spectrum Architects and at The State Department of Public Works. Currently he serves as the Technical Officer at Continental Developers, Nairobi County, with responsibility for scheme design, documentation and visualization of designs. He is committed to advancing architectural knowledge in the built environment, particularly in climate change.

ABSTRACT:

The future of architecture is climatic responsive design, whose aim is to create comfortable indoor spaces with minimal dependence on artificial energy. Laboratories and workshops are two learning environments that require specialized interventions to ensure thermal comfort of the users, good indoor air quality for the health of users, and energy efficiency. This is especially so with regards to production workshops, that consume a lot of energy and depend on the grid. This research investigated the design of Engineering Workshops. It assessed their environmental design on the three parameters of thermal comfort, indoor air quality and energy efficiency. The study proceeded on to recommend areas of intervention for their optimal performance, based on environmental building science standards and international benchmarks. Case studies of engineering workshops were conducted for Kenyatta University and Jomo Kenyatta University of Agriculture and Technology. The two campuses and workshop learning types of environment were selected judgmentally. The research employed objective quantitative field measurement using data loggers and subjective qualitative measurements using questionnaire survey. Analysis from data collected established that indoor air temperature for KU workshops ranged between 25 ^{0}C and 30 ^{0}C, while that of JKUAT workshops ranged between 27 ^{0}C and 31 ^{0}C. Wind speed for KU workshops ranged between 0 m/s and 2.2 m/s, while for JKUAT workshops it ranged between 0 m/s and 1.5 m/.According to ASHRAE standards, summer temperature should range between 22.2 C and 26.7 C, while wind speed should not exceed 0.8 m/s. In comparison with these standards, the KU & JKUAT workshop indoor air temperatures and wind speeds were outside the comfort zone. For both universities a majority of the respondents rated the workshops as being warm, therefore uncomfortable. The workshops were found to have high air temperature which made occupants experience thermal discomfort. To achieve optimal performance, various interventions were proposed including control of solar insolation, orientation of building fenestrations, daylighting, passive cooling and ventilation.

KEY WORDS: **Indoor air quality, thermal comfort, energy efficiency**

DESIGN PROJECT DESCRIPTION: REDEFINING KENYATTA UNIVERSITY'S SCHOOL OF ENGINEERING.

THE SITE:

These site is located within Kenyatta University and approximately 22 KM north of Nairobi's Central Business District (CBD). Its strengths include ease of accessibility, connectivity to the rest of the world and availability of exiting services such as electricity, water, sewer

Figure 1: Aerial image of the site at Kenyatta University. Source https://www.google.com/maps/place/Kenyatta+university+main+campus/, 2024

line and internet. One weakness which stands out is noise emanating from the railway line to the south of the site.

THE CONCEPT:

Interconnectivity

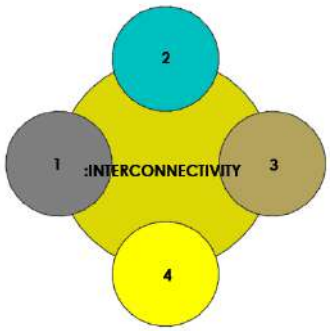

Figure 2: Functional elements connected. Source: Author, 2024.

The design is conceptualised as the linkage between two forms representing the old (existing) and new developments while ensuring a seamless interaction. The new developments consist of the auditorium, restaurant, adminisgtration block, academic and research block, framed against the existing development.

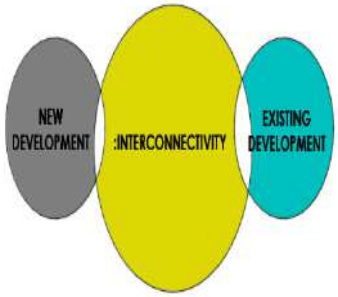

Figure 3: Two functional poles of connectivity. Source: Author, 2024.

OUTLINE DESIGN AND CONCEPTUAL MODELS

Figure 4; Outline design sketch 1 and conceptual model. Source, Author, 2024

Figure 5: 3D sketch. Source, Author, 2024.

To achieve interconnectivity, elements such as a sky bridge, pergolas and courtyards were incorporated.

Figures 6, 7 & 8: Outline design sketch; Conceptual sketch; 3D view.. Source: Author, 2024.

THE DESIGN:

The design was informed by findings and recommendations from the research thesis. Among them is the provision of spaces with acceptable Indoor Air Quality, thermally comfortable and incorporation of energy efficient strategies

Figures 9-17: Project summary. Source: Author, 2024.

The design comprises of the administration, academic and auxiliary zones. The academic zone includes offices and washrooms. It also features lecture halls, offices, presentation spaces and washrooms. The auxiliary zone includes auditorium, restaurant, parking and green areas.

Climatic design strategies considered include orientation, daylighting, ventilation, materials (high performance windows, natural stones) and considerations for renewable energy.

Figure 18: Physical Model – A framed construction system has been utilized here for the development. Source: Author, 2024.

BUILDING FROM PLASTIC WASTE: OPPORTUNITIES AND LIMITATIONS IN KENYA.

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Supervisor: Arch. Franklin Mwango, Lecturer, Dept of Architecture & Int. Design, SEA, KU, mwango.franklin@ku.ac.ke

SDG 13: Climate Action/**A-2063 Aspiration 1,** which aims for inclusive growth and sustainable development, particularly - **G7:** Environmentally sustainable and climate-resilient economies and communities.

SDG 13 Theme: Addresses climate change by exploring plastic waste as a viable construction material.

Sub-theme: Integrating eco-conscious practices into architecture; transforming waste into functional building components; and preventing plastic waste from reaching water bodies through innovative construction practices.

Alignment to Vision 2030: (1) *Economic Pillar:* Contributes to the Economic Pillar by promoting innovative recycling technologies that drive industrialization. It showcases how sustainable practices can be integrated into the economic fabric of the nation, fostering growth while protecting the environment. (2) *Social Pillar:* The project aligns with the Social Pillar by enhancing the quality of life through community-centric design. It emphasizes the importance of social spaces where people can gather, work, and socialize, thereby strengthening social cohesion and equity. (3) *Political Pillar:* By advocating for participatory governance in environmental management, the thesis project supports the Political Pillar. It encourages an issue-based, people-centered, result-oriented, and accountable democratic system, where community involvement is key to successful waste management. The project therefore stands as a testament to the potential of thoughtful design in creating a prosperous, equitable, and environmentally conscious future for Kenya.

Alignment to NACRA: The thesis directly aligns with the National Construction Research Agenda (NaCRA) under the subject area on Environmental Issues, specifically referencing research areas 23, 24, 25, and 26. *Sustainable Methods for Harvesting Natural Resources (research area 22)*: The thesis explores sustainable methods for utilizing plastic waste as a construction material, which is in direct alignment with NaCRA's focus on environmentally friendly resource harvesting. *Emerging Trends Relating to Climate Change Resilience (research area 23):* The thesis addresses how building with

plastic waste contributes to climate change resilience, a key concern in NaCRA's agenda. *Waste Management Practices in Construction (research area 24):* The research investigates current waste management practices and proposes improvements, including the use of plastic waste in construction. *Imported Construction Materials and Their Impact (research area 25):* The thesis touches on the reduction of reliance on imported materials with local plastic waste. *Protected Areas, Heritage Zones & Monuments (research area 26):* The thesis considers how construction with plastic waste affects protected areas and heritage sites, ensuring preservation while utilizing innovative materials.

Alignment to NUA: The paper aligns with the New Urban Agenda (NUA) by promoting sustainable urban development. It highlights innovative building solutions that tackle environmental issues and enhance resource efficiency, particularly through the use of recycled plastic as a construction material. Focusing on Kenya, where there is a pressing need for affordable, eco-friendly building options, the research advocates for local sustainable practices that reflect the NUA's vision for inclusive and resilient cities. Key contributions include, (1) practical application seen through case studies, such as the Jem Park unit by Timao Group, showcase how recycled plastic can effectively transform urban environments; (2) Equitable access by emphasizing inclusivity in urban design, supporting the NUA's aim for equal access to urbanization benefits for all community members; and (3) a roadmap for implementation. The findings offer guidance for policymakers and builders in achieving the NUA's standards, aligning with Kenya's Vision 2030 and global UNSDGs.

BIOGRAPHY:

Maryam Wangeci champions architectural exploration through the lens of gender inclusivity with the aim of creating spaces that uplift and celebrate diversity. Her designs are informed by an acute understanding of gender dynamics, ensuring inclusivity is at the core of every project. Collaborating with relevant organizations such as C40 Cities, Maryam spearheads initiatives that resonate with community needs, making inclusivity a tangible reality. Notably, her first degree in B. Architectural Studies culminated in a groundbreaking research paper on gender-inclusive design in sports grounds, shedding light on the critical intersection of architecture, gender, and accessibility. Her participation in discussions on gender-inclusive design with industry players like Tomorrow by Design further demonstrates this dedication. Beyond architecture, Maryam's passion extends to the digital frontier. She delves into software development, web3 technologies, and game art while investigating the nexus of innovation, technology, and social impact. Maryam believes that architecture transcends mere aesthetics. It is a catalyst to defy convention, challenge norms and elevate the human spirit with societal prosperity at the core.

ABSTRACT:

This paper investigates the potential of plastic waste as a sustainable building material in Kenya, in light of the environmental challenges posed by plastic pollution. The study is grounded in the urgent global need for effective waste management and the exploration of circular practices in the construction industry. It assesses the feasibility of repurposing plastic waste, considering the high costs and environmental impact of conventional building materials in Kenya. The theoretical framework is rooted in sustainable development and circular economy principles, while the analytical lens is trained on material science and architectural innovation. The research employs a mixed-methods approach in a blend of quantitative/qualitative approaches, environmental behaviour observation and survey, that includes a pivotal case study of Jem Park unit by Timao Group which

exemplifies the successful application of recycled plastic in building affordable housing. Additional case studies, such as Gjenge Makers' Pavers, highlight the challenges and breakthroughs in material science and architectural innovation. Findings demonstrate the potential of plastic waste as a construction material, offering environmental and affordability benefits. The research also identifies challenges in the efficiency of production and public acceptance. It emerges here that in order to realize the potential of the waste recycling concept, there is need for holistic strategies that integrate technological advancements, policy frameworks, and societal support. The implications of this research suggest a shift towards sustainable architectural practices and environmental conservation. It is important to advocate for ongoing research and refinement of plastic waste utilization in construction, in alignment with Kenya's Vision 2030 and the global United Nations Sustainable Development Goals (UNSDGs).

KEY WORDS: **Circular Economy, Material Science, Plastic Waste.**

DESIGN PROJECT DESCRIPTION: *Plastopia'*-VET INDUSTRIAL PARK

Figures 1: Overview of the design project. Source: Author, 2024.

BACKGROUND AND LOCATION:

According to the National Environment Management Authority (NEMA), only 7% of the plastic waste generated in Kenya in 2023 was recycled, while the rest (approx. 37 kilotons) was littered or landfilled. The project is located at Vet farm, next to the former Ngong dumpsite in Kajiado County, which was transformed into a green space after its closure in 2023. It aims to improve the living conditions and the environmental quality of the area. The project also serves as an innovation hub that showcases the potential of plastic waste as a resource for various purposes, such as building materials,

crafts and education. It also includes communal spaces that foster social interaction and environmental awareness among the urban residents. The project uses advanced sustainable technologies to convert waste into affordable construction material.

Figure 2: Idea Board. Source: Author 2024.

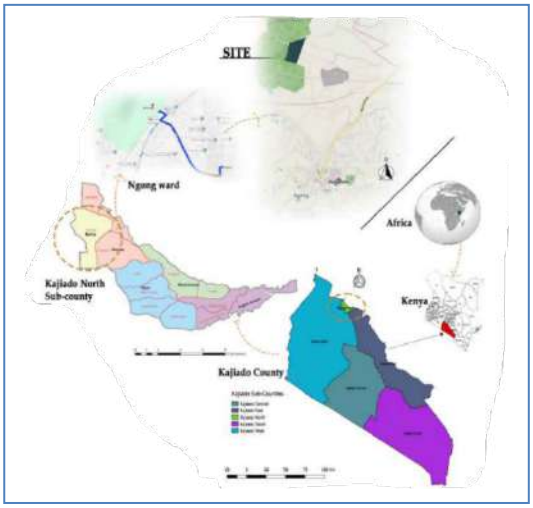

Figure 3: Location map of project. Source: Author 2024.

Figure 4: Justification of Location. Source: Author, 2024

THE CONCEPT: THE CONCEPT

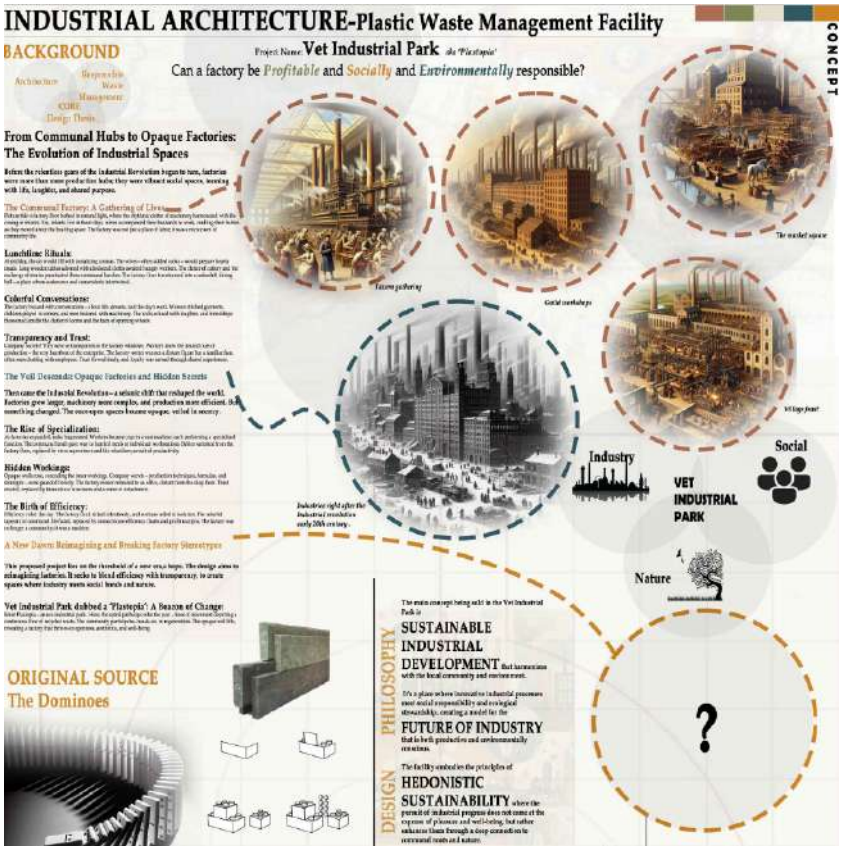

Figure 5: Description of the design concept. Source: Author, 2024.

Kenya's plastic waste crisis, offering a sustainable, community-driven solution.

THE DESIGN: Central to the design is the community spine, a symbol of unity and

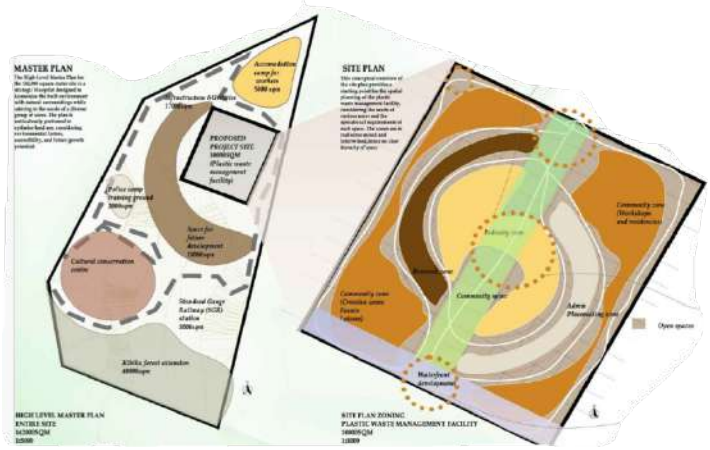

Figure 7: The zoning process. Source: Author, 2024.

Plastopia ***is a plastic waste management facility*** that reimagines the essence of factories. Transforming them from monochrome, lifeless structures into

ent. Source: Author 2024

vibrant hubs of social and industrial synergy. Rooted in the pre-industrial revolution era, where factories were communal spaces buzzing with life. It is therefore a facility that marries industry with social interaction and nature. It stands as an architectural beacon against

Figure 6: Concept Development. Source: Author, 2024.

collaboration, where locals, artisans, and stakeholders converge to breathe life into the project. The facility harnesses wind potential of the Ngong region, utilizing façade wind turbines for power, thus reducing its carbon footprint and serving as a beacon of education on clean energy. The design is a tapestry of green spaces, rainwater harvesting, and natural ventilation, positioning it as a living testament to sustainability.

Figure 8: Site design elements. Source: Author, 2024.

Using recycled plastic blocks innovatively as a primary building material, Plastopia showcases the untapped potential of plastic, turning waste into a resource that strengthens the facility's core and stands as a monument to environmental stewardship. It is a harmonious blend of aesthetics, functionality, and social impact, echoing the lively spirit of ancient factories and fostering creativity, interaction, and community. Industrial architecture in this case narrates a new story, one that stirs curiosity, hope, and a collective sense of duty towards our planet. Visitors are immersed in an environment where tactile surfaces, textured walls, the interplay of light, and thoughtful spatial arrangements serve as constant reminders of our bond with nature. Plastopia is not just a design project; it's a clarion call to revolutionize our approach to waste, to empower communities, and to construct a future that's sustainable. It's an architectural movement that catalyses societal progress, weaving together innovation, resilience, and beauty to inspire a better tomorrow.

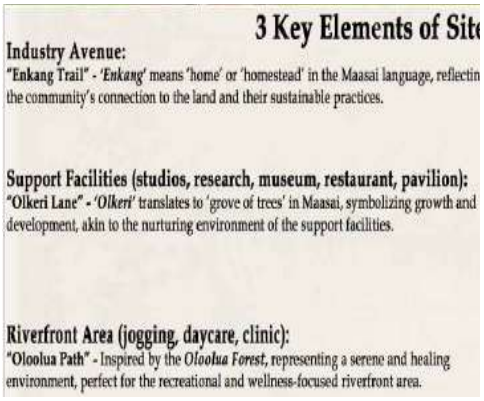

Figure 9: The elements of the site. Source: Author, 2024.

Figure 10: Detailed scheme design of the industry Building. Source: Author, 2024.

This design evolved from conceptualization to the virtual realm. The project was then translated into a space in the metaverse, allowing users to experience the design as if they were physically present within it. This immersive experience aligns perfectly with the objective of the community at the center fostering a deeper connection and engagement with the entire process. Get a glimpse of the experience here

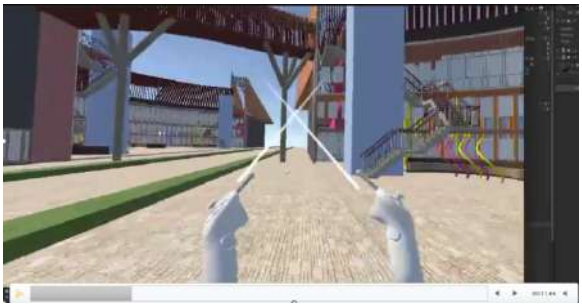

Figure 11: Project in the virtual realm. Source: Author, 2024.

Figure 12: Design Studio Jury - experiencing the project in the Metaverse. Source: Author, 2024.

ARCHITECTURAL DESIGN FOR OPTIMIZING ENERGY PERFORMANCE IN CANCER CARE FACILITIES.

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Supervisor: Dr. Wairimu Maina, Lecturer, Architecture and Interior and Design DAID, SEA, KU, maina.wairimu@ku.ac.ke

SDG 13: Climate action - Take urgent action to combat climate change and its impacts /**A-2063 G10:** Environmentally sustainable and climate resilient economies and communities
SDG 13 Theme: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries/**A-2063 G10 Theme:** Climate resilience and natural disasters preparedness

Sub-Theme: Biodiversity, conservation, and Sustainable natural resource management.

Alignment to Vision 2030: The primary goal of the Vision 2033 is to transform Kenya into a newly industrialized, middle-income country with a high quality of life for all citizens by 2030. The vision is established upon the three pillars of economics, society, and politics. In alignment with this vision, the research empathized with the social pillar, guided by the recurring principle of equity to promote social cohesion and enhance the prosperity of all Kenyans through a fair and inclusive social development programme. This inquiry also contributes to foundation 3.6 on Science, Technology, and Innovation (STI) which calls for a stronger focus on applying science, technology, and innovation to boost productivity and efficiency across the economic, social, and political pillars. More specifically, the study resonates with the social strategy that emphasises investment in the people of Kenya and particularly its specific strategy 5.4 on environment with its expressed aim to have a clean, secure and sustainable environment by 2030. This necessitates the creation of environmentally sustainable and climate-resilient economies and communities that ensure access to affordable, reliable, sustainable, and modern energy for all.

Alignment to NACRA: Research here also embraces research in the specific technical discipline of the National Construction Research Agenda (NACRA) (1) on construction technology and materials. It supports the related research area (1) on Suitability and adoption of local/indigenous construction materials and its objective (c) that seeks to establish the utilization of local & composite materials in the construction industry in Kenya with special on achieving functionality and sustainability. Additionally, this study finds relevance in the specific technical discipline of the National Construction Research Agenda (NACRA) (5) on environmental issues. It affiliates more specifically with the research area (23) that prioritizes inquiry on emerging trends that relate to climate change resilience like smart cities, railway cities, university cities, green buildings and intelligent buildings.

Of particular interest here is goal (b) with an interest to ascertain the level of use of renewable energy in construction processes and systems in Kenya.

BIBLIOGRAPHY

Mungai Kairu is a graduate architect from the Department of Architecture and Interior Design (DAID) in Kenyatta University. He refined his skills at Stangee Company Ltd., the State Department for Public Works, and Decalogue International Ltd. In these workplaces he gained noteworthy expertise in creative and environmentally friendly design solutions. Currently, Mungai works as a graduate architect at Decalogue International Ltd. He is passionate about environmental and sustainable design and the arising impact of energy efficiency in the built environment.

ABSTRACT

This research investigates the environmental design and energy performance in the planning and designing of cancer care facilities. Healthcare facilities, particularly those for cancer, are energy-intensive due to continuous operation of advanced equipment, and environmental control systems. This makes them more energy-intensive than general hospitals. Energy efficiency in the building sector entails a distinctive set of end-user activities with various energy use implications. In such instances, space heating, space cooling and lighting constitute the major energy uses in a building. Using Edge user guidelines, case studies were selected judgmentally, in order to provide empirical evidence and practical insights into how eco-healing principles, energy performance and patient well-being where applied in the design and construction of cancer care facilities. The study involved the use of the sequential exploratory design, QUAL-QUAN method that entailed relied on qualitative data that emerged from archival sources, focused group and individual respondent interviews, observations and case studies. This research approach was complemented with quantitative data that was obtained through simulations modelling and quantitative surveys, to provide an enhanced and comprehensive triangulation of inquiry. It was established that the architectural design of the spaces displayed passive designs for ventilation and lighting that were reliant on the building form and orientation of the spaces. Further it was confirmed that hospitals consumed more energy as a result of their diversified functions and activities. Their energy performance could be optimized through environmental analysis of the design of buildings. Such an approach would help to determine the disposition and levels of optimization of ventilation and daylighting in the spaces relevant to the extant environmental conditions. It was therefore essential to control building orientation, with respect to wind directions and solar paths. These would ideally be matched with essential attributes of a building that include building form, window-wall ratios, building heights, spatial depths, fenestrations and surface finishes.

KEYWORDS: **Energy efficiency and performance, environmental design, sustainability.**

DESIGN PROJECT DESCRIPTION: ECO-CARE ONCOLOGY TREATMENT & RESEARCH FACILITY.

THE PROJECT BRIEF:

The Eco Care Oncology Treatment and Research Facility aims to be a beacon of hope for individuals battling cancer. It merges advanced technology, innovative research, and compassionate care within a holistic environment. This project seeks to optimize energy efficiency in cancer care facilities by

integrating nature-based infrastructure and climate-responsive design principles. In so doing, it hopes to set a new standard for sustainable healthcare environments.

Figure 1: Exterior perspective of the Oncology facility showcasing daylighting atriums, solar tubes, solar harvesting roofing, wind interactive facade louvers and green terraces incorporated as passive design approaches. Source: Author, 2024.

THE SITE LOCATION:

Figure 2: Site location, Source: Author 2024.

Eco Care Oncology Treatment and Research Facility is an innovative project designed to blend ecological sustainability with state-of-the-art healthcare. Located on a 4.5-acre site within the Tropical Savanna landscape of Konza Technopolis City, spanning Machakos, Kajiado, and Nairobi counties, this facility epitomizes a harmonious balance between human intervention and nature preservation.

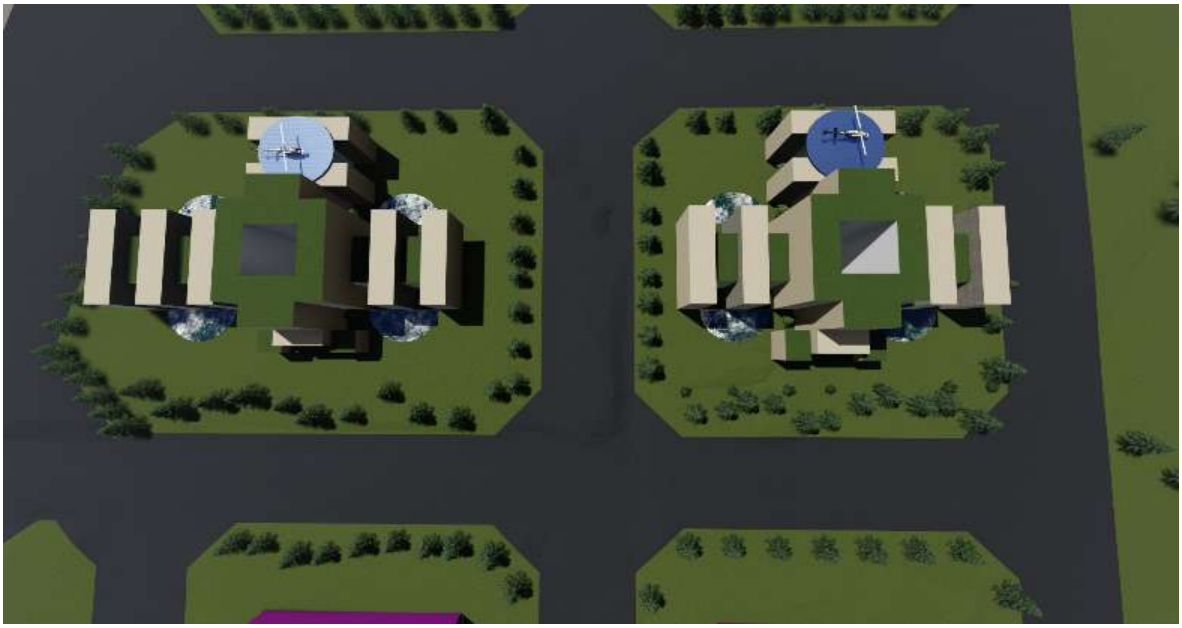


Figure 3: Site context. Source: Author, 2024.

THE CONCEPT:

The design approach is informed by a contextual analysis of the existing site. From the review of the local climatic conditions, consideration of nature-based infrastructure is conceptualized to create harmony between the proposed structure and the existing ecosystem. This approach allows the design to harness the forces of the existing site and optimize them to come up with an energy-efficient cancer center.

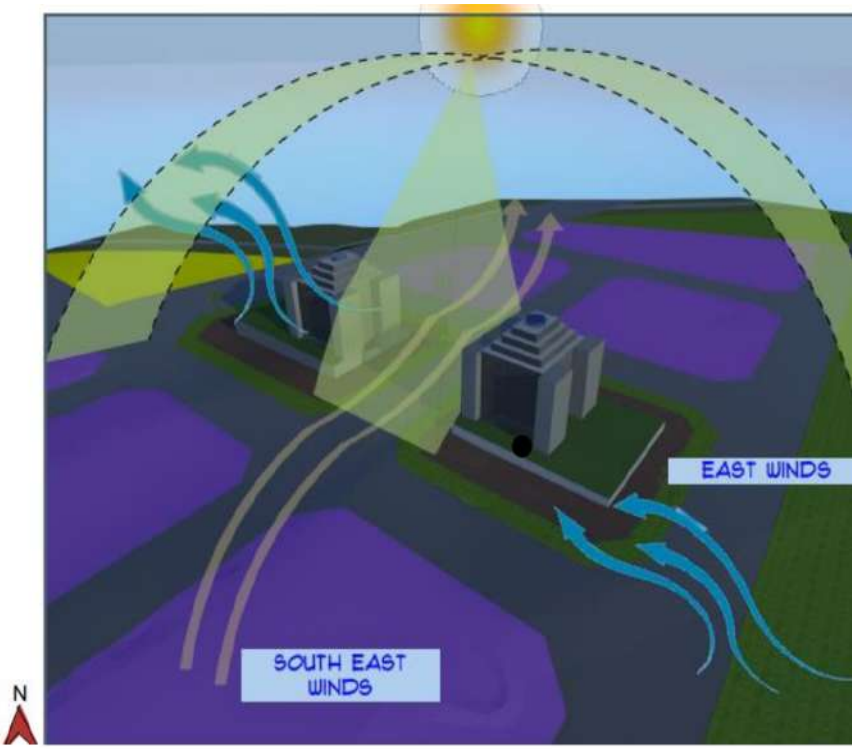


Figure 4: Site climatic analysis. Source: Author, 2024.

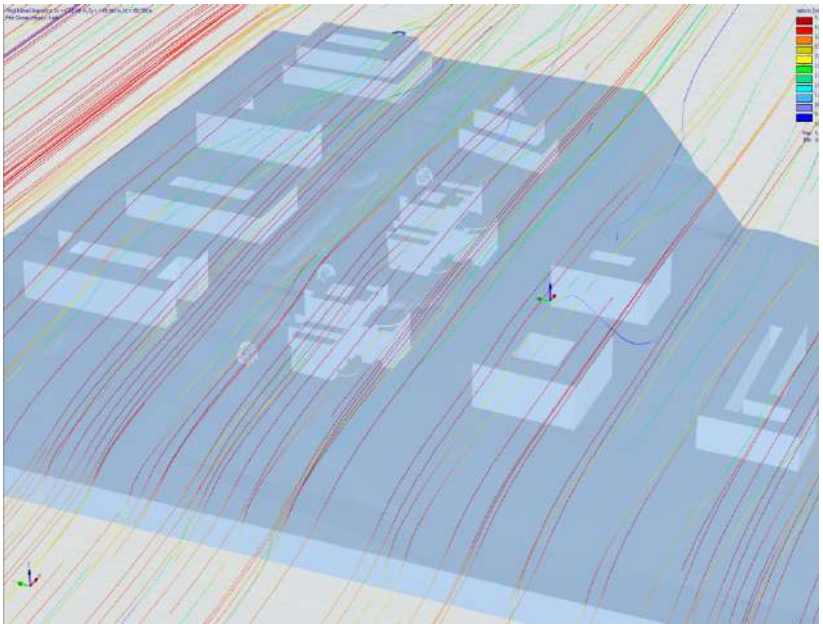


Figure 5: Simulation of the existing wind patterns. Source: Author 2024.

The East-West orientation of the facility is accorded pre-eminence. Handled with appropriate sun shading, this not only lowers the exposure of the building facades to the sun path, thus lowering thermal heat gain from solar radiation but also allowing for the East-West flowing wind to flow through the entire structure resulting in wind-induced ventilation. The orientation promotes natural ventilation in most of the spaces within the facility that need it, avoiding mechanical energy consuming alternatives, for the proper functioning of the of the spaces.

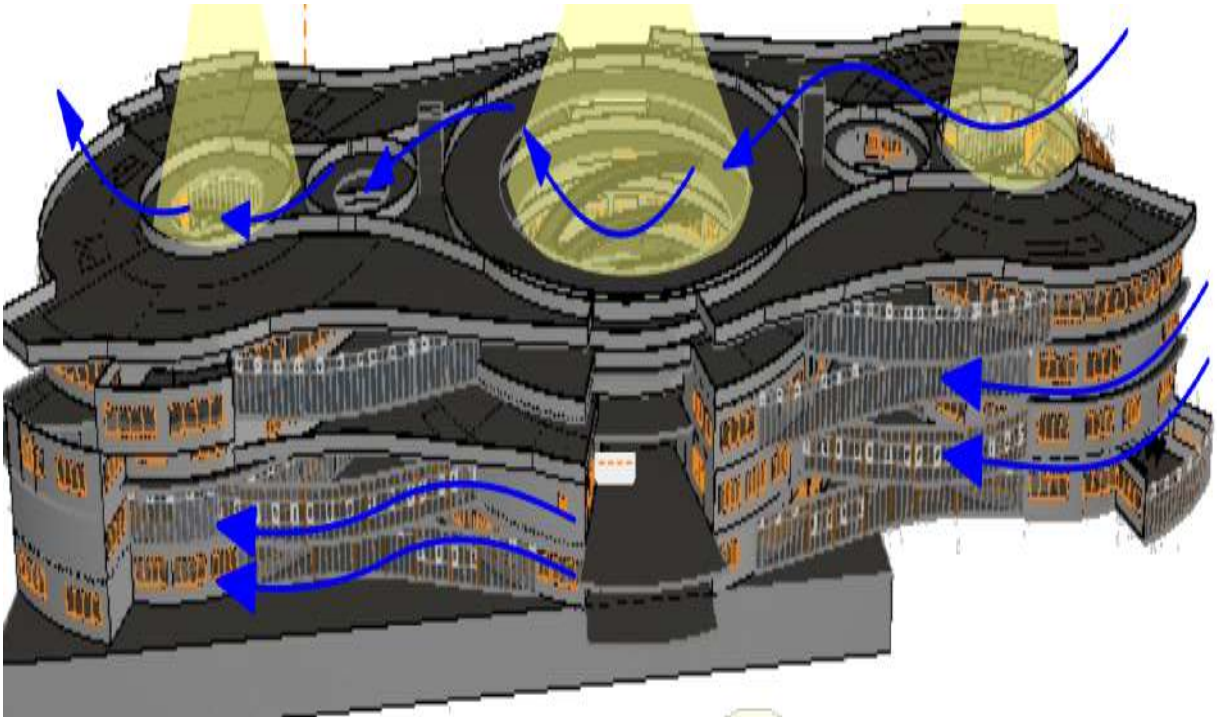


Figure 6: Building East-West orientation. Source: Author 2024.

The form of the building seeks to interact with the incoming wind to optimize its potential to promote natural ventilation. The facility therefore takes a cylindrical shape to allow wind to flow faster in its façade. This positively accentuates wind-induced ventilation

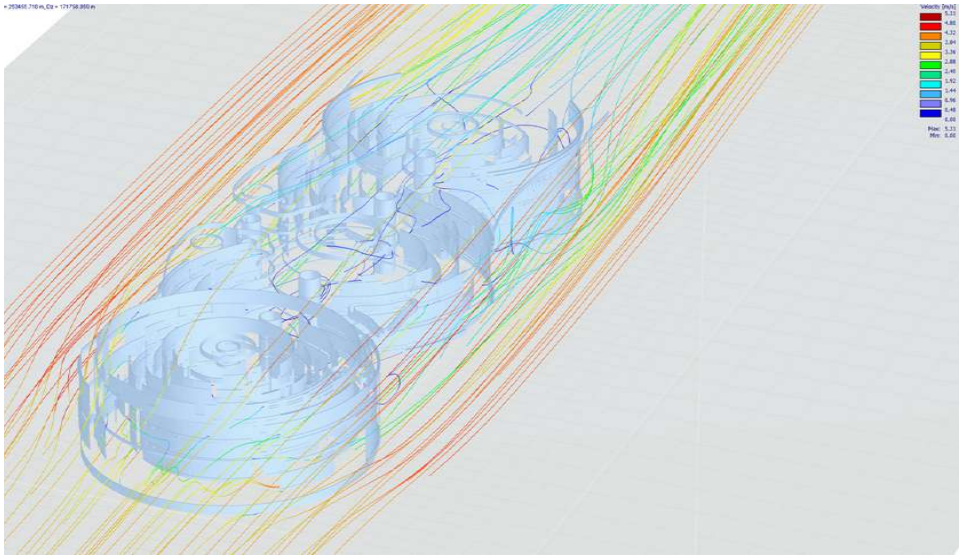


Figure 7: Simulation of the wind patterns interacting with the building shape. Source: Author 2024.

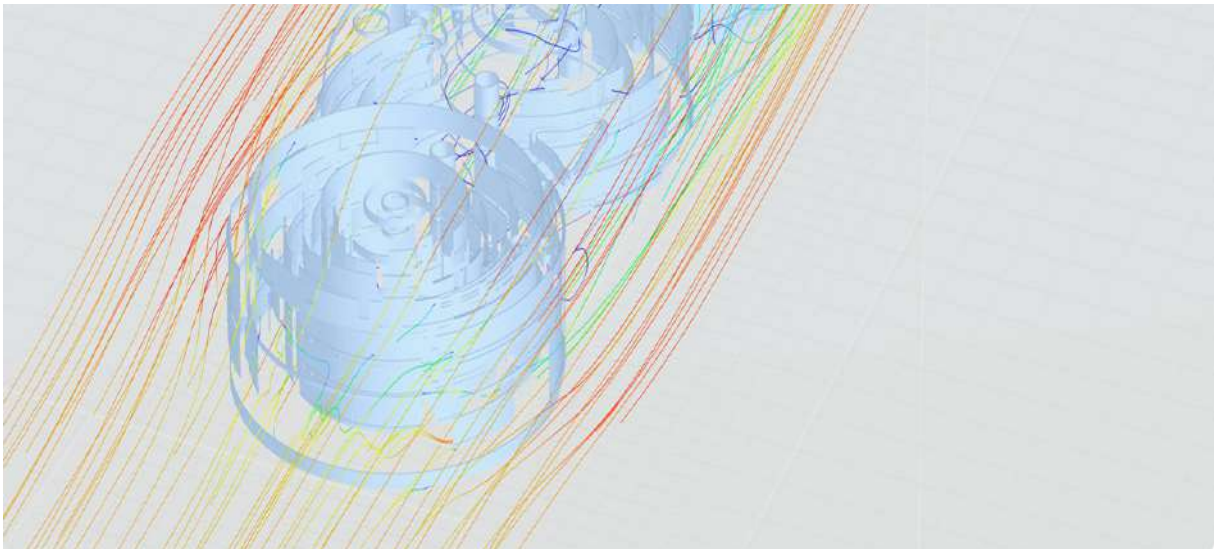


Figure 8: Integration of facade louvers to the building design. Source: Author 2024.

ENERGY EFFICIENCY APPROACH

Nature-based infrastructure (NBI) is central to the design philosophy. It enhances energy efficiency while fostering a healing environment. Key strategies include:

- **Natural Ventilation**: Utilizing wind-driven ventilation through façade louvers and building orientation helps minimize use mechanical systems. This lowers energy consumption and operational costs. Simulations were done to determine the most suitable positioning of the wind propellers so as to promote wind-induced ventilation.

- **Daylighting**: Maximizing natural light is achieved by incorporation of daylighting strategies. These include solar tubes and solar trees,. It reduces reliance on artificial lighting and also improves indoor environmental quality.

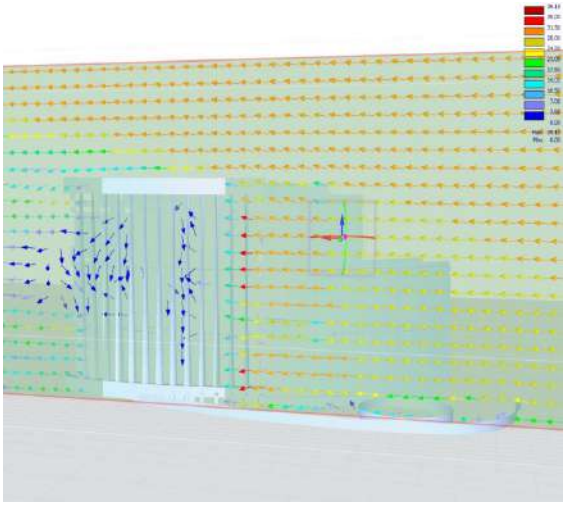


Figure 9: Simulation of wind propellers promoting wind driven ventilation. Source: Author 2024.

Figure 10: Solar trees in atriums. Source: Author 2024.

Evaporative Cooling: Implementing indoor ponds and urban greenery is used to reduce the need for conventional air conditioning.

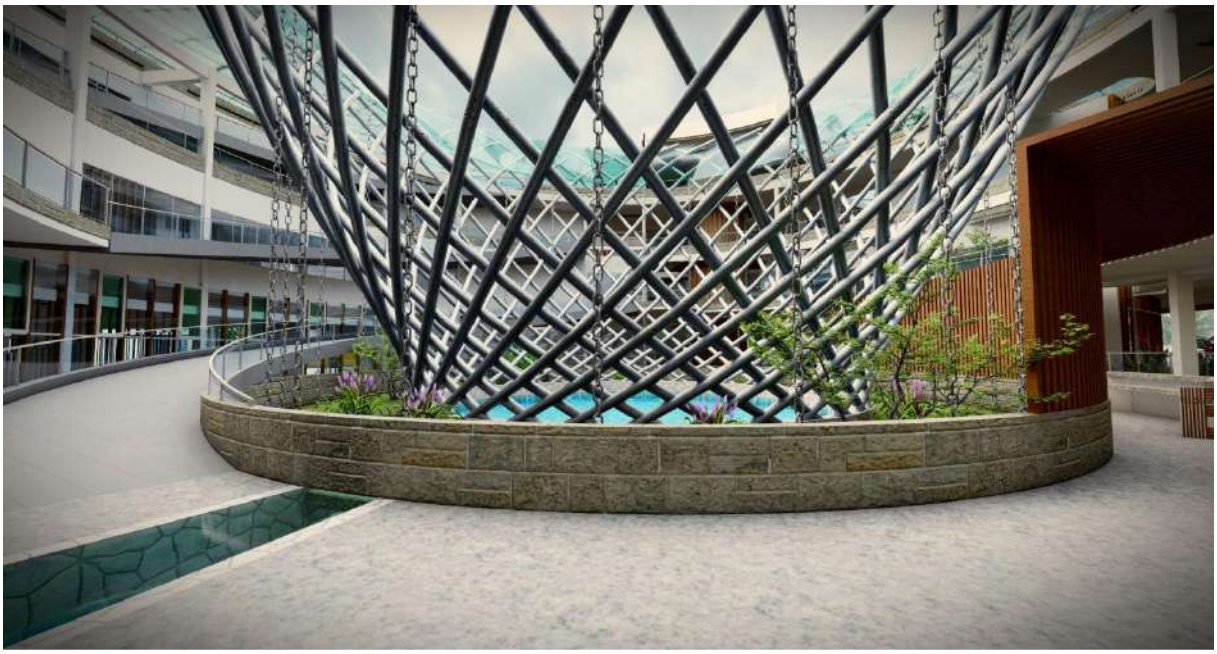


Figure 11: Integration of Indoor ponds for evaporative cooling. Source: Author 2024.

Green Roofs and Urban Greenery: Incorporating vegetation on the roofs and nature pockets to sequester carbon and mitigate the urban heat island effect, further promotes sustainability.

Figure 12: Contextual render of the building section. Source: Author 2024.

CLIMATE RESPONSIVE DESIGN

Tailored to a tropical savanna setting, the facility incorporates the following climate-responsive elements:

- **Solar Harvesting**: Strategic building orientation and extensive use of solar panels on solar trees is brought on board in order to ensure that a significant portion of energy demand is met through renewable sources.
- **Daylighting Strategies**: Reducing artificial lighting needs and enhancing indoor quality through thoughtful incorporation of daylighting solar tubes is embraced.
- **Wind-Interactive Louvers**: Efficient natural ventilation that maintains optimal indoor air quality and comfort is facilitated.
- **Urban Forests and Water Features**: Enhancing aesthetic appeal and harnessing the local microclimate, is used to create a cooler environment that benefits patients and staff.

Figure 13: Incorporation of green terraces and Indoor ponds. Source: Author 2024.

SUSTAINABILITY AND WELL-BEING

By prioritizing passive design strategies and NBI, the Eco Care facility achieves substantial energy savings and operational efficiency. The integration of urban greenery and water features contributes to the overall well-being of occupants by creating a serene and restorative environment. The Eco Care oncology treatment and research facility exemplifies the transformative potential of nature-based solutions in healthcare design. It provides a blueprint for future sustainable and energy-efficient medical facilities. It demonstrates how ecological design principles can enhance environmental stewardship and patient care. Through this project, a new paradigm in healthcare design is established, where sustainability and healing co-exist harmoniously.

Sustainable Development Goal 15

Life on Land

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. Protect, restore, and promote sustainable use of the terrestrial ecosystem.

Theme:

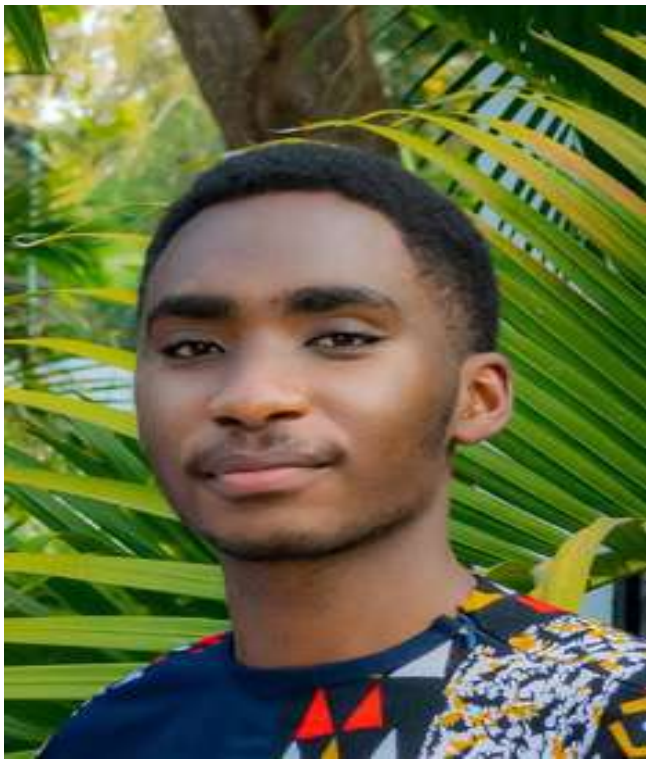
Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.

Agenda 2063 Goal 07

Environmentally sustainable and climate resilient economies and communities

Theme:

Biodiversity, conservation, and sustainable natural resource management.



TOWARDS APPROPRIATE ARCHITECTURAL STRATEGIES FOR ENHANCING THE WELL-BEING OF CAPTIVE WILDLIFE IN KENYA.

Researcher: Lawrence Muchiri Muriithi, B.Arch. Studies. Hons, 2023/4, Kenyatta University, lawrencemuriithi.arch@gmail.com

Supervisor: Dominic Kinyua Gitau, Landscape Architect, Urban and Regional Planner, Tutorial Fellow, Architecture & Planning, Department of Architecture and Interior Design, School of Engineering and Architecture, Kenyatta University, kinyua.dominic@ku.ac.ke

SDG 15: Life on Land/**A-2063 G7:** Environmentally sustainable and climate resilient economies and communities.

SDG 15 Theme: Halting biodiversity loss/**A-2063 G7Theme:** Biodiversity, conservation, and Sustainable natural resource management.

Sub-theme: Biodiversity and Natural Habitats (15.5)

Alignment to Vision 2030: This research embedded into intentions of the economic pillar of Kenya's vision 2030 that seeks to maintain a sustained economic annual growth of 10% up to 2030. The related economic vision and strategy 4.1 on tourism purposes to add value to local products and services by bringing Kenya to among the top 10 long-haul destinations in the world with high-end, diverse, and unique visitor experience. Pertinent goals set that bear clear relevance to this inquiry include improving facilities in under-utilised parks and creating new high value niche products. Inherent to this strategy and objectives is the refurbishing of wildlife research stations in the country to promote wildlife conservation and management.

Alignment with National Construction Research Agenda (NaCRA): The NaCRA research area 4 on the use of alternative and merging technologies for construction products relates well with this inquiry. Its particular objectives "b" & "c" on traditional and emerging construction materials, technologies and systems for resilience and sustainability related well to implicit orientation of this inquiry to explore innovative, durable, efficient and sustainable building practices for wildlife habitats.

BIOGRAPHY (97/100):

Muchiri is a Kenyatta University graduate architect and a winner of the 2023 Crown Paints Award of Excellence. He has a passion for user-centered designs. He served as the Secretary General for the Architecture Student Association, Kenyatta University (ASA-KU) and is a member of the Architectural Association of Kenya (AAK). Currently at DND Consultants, Muchiri excels in innovative design within limited spaces. He co-founded Satisfi-Homes Limited, a design-build firm inspired by his enthusiasm for real estate and micro-homes. Muchiri aspires to advance his learning in real estate management while participating in sustainable humanitarian design projects in Africa.

ABSTRACT (265/250):

Wildlife captivity has evolved over time reflecting the dynamics in a relationship between humans and wildlife. Through the years, there have been significant shifts in the circumstances leading to wildlife captivity including conservation, research, education and recreation. However, the design of facilities for captive wildlife in Kenya has been accorded little attention with a resulting disproportionate slow pace in its development. This challenge is intensified by a general shortfall of design and nature conservation experts. Most contemporary designers lack interest in conservation initiatives. These shortcomings tend to diminish the value that natural wildlife contributes to the development of heritage tourism. This study therefore investigated the manner in which architectural design can influence the well-being of captive wildlife in Kenya, while focusing on the Nairobi Animal Orphanage. To achieve this, the study assessed the state of the Nairobi Animal Orphanage and identified the needs in the built & natural environment of captive animals that contributed to their well-being. Precedence from suitable international projects and programmes were studied as good practices to be emulated. A case study approach was employed, and research data were gathered through observation, interviews, literature and review of archival records. Data was analysed using descriptive statistical methods. It emerged that captive wildlife in enclosures with more naturalistic design exhibited natural behaviour. The study concluded that the design of local animal sanctuaries substantially complied with existing local guidelines for captive wildlife management in some respects. Nevertheless, the designs and developments required improvements in the strategies for environmental enrichment. In effect then, the study provides new knowledge to inform development of policy and practice.

KEY WORDS : Conservation; Naturalistic Design; Well-being; Wildlife Captivity

DESIGN THESIS: BEYOND BARRIERS - A BLACK RHINO CONSERVATION AND RESEARCH CENTRE.

THE SITE:

Figure 1:Nairobi County. Source: Author, 2024, adapted from google maps.

The Beyond Barriers project was inspired by the Kenya Wildlife Service's initiative to enhance conservation efforts for the critically endangered black rhino. This followed its launch of the recovery and action plan for the Black Rhino in 2023. The national park is home to 101 black rhinos and other wildlife species. It is also home to various wildlife facilities such as the Nairobi Animal Orphanage and the David Sheldrick Elephant Orphanage.

The Nairobi National Park is a suitable location for developing this facility that supports animal care, conservation, and public engagement. It features a desirable existence of natural environments and wildlife within, close proximity to urban centres, educational institutions, and a diversified tourist population. All these provide the necessary environment, resources and audience.

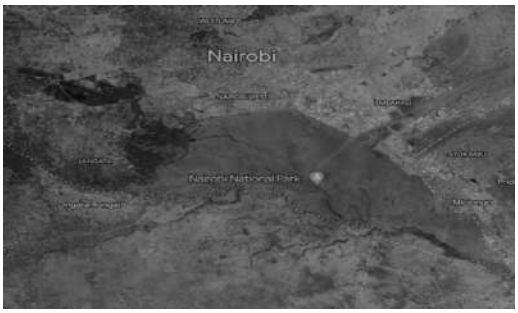


Figure 2; Nairobi National Park. Source: Author, 2024, adapted from google maps.

Figure 3: The site. Source: Source: Author, 2024, adapted from google maps.

PROJECT BRIEF:

The development on the 170 acres land is zoned into three parts. First is the black rhino research and education centre. Then there is the black rhino centre where captive black rhinos are housed in outdoor and indoor enclosures. Breeding, treatment and rehabilitation would take place here. The final zone is the recreation area that features accommodation, light-commercial and leisure activities.

THE CONCEPT:

The design of the facility is inspired by organicism. Research shows that captive-wildlife tend to thrive in a naturalistic environments where they can express their natural behaviour.

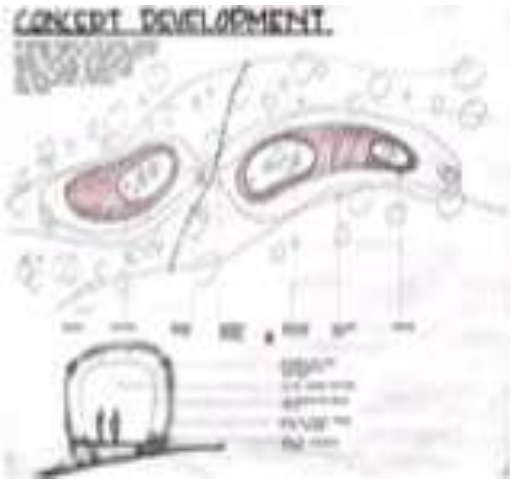


Figure 4: Organic layout and form. Source: Author, 2024.

Figure 5: Conforming to the site. Source: Author, 2024.

DESIGN STRATEGIES:

Naturalism Wood, treated tree logs, sand and stone materials were extensively used in order to mimic the natural landscape.

Figure 6: Master plan with an organic layout. Source: Author, 2024.

Environmental enhancement

The outdoor enclosures were provided with mud-baths and connected to the existing river on site to perpetuate the rhinos natural behaviour of mud bathing and cooling.

Form and Shape

Curvilinear layouts and forms were applied as a principle of organic architecture as studies shows curvilinear forms and shape are ideal in rehabilitation facilities for both animals and humans.

Figure 7: Organic form built with wood, stone and ethylene tetrafluoroethylene glazing. Source: Author, 2024.

Visitor engagement

The design incorporated a recreation centre to attract visitors. This included accommodation, picnic facilities, restaurant, and boardwalks with views of the park. The boardwalks are elevated above ground to create views of the rhino outdoor enclosures while providing safety and security for both animals and visitors.

THE INFLUENCE OF ARCHITECTURE ON HUMAN WILDLIFE CO-EXISTENCE IN SAFARI ECO-LODGES, A CASE OF NANYUKI.

Researcher: Aurelia Bosibori Nyamboki, B.Arch. Studies,Hons, 2023/4, KU, aurilbosibori@gmail.com

Supervisor: L.Arch. Regina Wango Kasau, Lecturer DAID,KU, kasauregina@ku.ac.ke

SDG 15: Life on Land/**A-2063 G7:** Environmentally sustainable and climate resilient economies and communities.

SDG 15 Theme: Protecting and restoring terrestrial ecosystems for sustainable development/**A-2063 G1 Theme:** Biodiversity conservation, sustainable land management and restoration of degradable land.

Alignment to Vision 2030: This research directly supports Kenya's Vision 2030 Economic Pillar, which aims to transform the country into a prosperous, middle-income nation through rapid and sustained economic growth. By exploring sustainable architectural design in tourism, the research contributes to achieving the national economic vision and strategy, which emphasizes the importance of adding value to our products and services. More specifically, the study reinforces strategy 4.1 on tourisms that seeks to make Kenya one of the top 10 long-haul tourist destinations in thew world offering high-end diverse and distinctive visitor experience. The focus of study on safari lodges rhymes with the specific strategy of improving facilities in underutilised parks, creating high value niche products such as cultural, eco-sports and water-based tourism.

Alignment to NACRA: The study's focus on minimizing the environmental impact of safari ecolodges through thoughtful architectural design and site planning is consistent with NaCRA's subject area 5 on environmental issues. Research area 22b whose objective promotes adoption of appropriate environmentally friendly systems (infrastructure and building design) is a pertinent foundation for this study. Further, research area 34 of the subject area 7 on legal and regulatory framework also benefits from this study given its interest on adaptation to climate change through effective environmental management within the construction industry. This includes reducing habitat disturbance and promoting sustainable practices. The focus on wildlife, their habitats, patterns in constructing tourism infrastructure so as to ensure that tourism facilities do not adversely impact local habitats and mitigate human-wildlife conflicts in the research supports NaCRA's goals by advancing sustainable tourism practices that protect natural resources and enhance overall environmental health.

BIOGRAPHY:

Aurelia Bosibori is a graduate architect of the Department of Architecture and Interior Design (DAID), at the Kenyatta University. Aurelia enhanced her skills at the Design Tone(K) ltd and the Kenyatta University

Architectural offices taking up roles in both architectural drafting and project management. Her passion lies in sustainability where she is dedicated to creating eco-conscious spaces that minimize environmental impact and promote a high quality of life through thoughtful and sustainable architectural solutions.

ABSTRACT:

This study explored how architectural design can promote coexistence between human beings and wildlife in shared habitats, with a focus on safari ecolodges in Nanyuki and Laikipia County. Coexistence, in this context, refers to minimizing disturbances between human beings and wildlife that may be caused by either group. The discussion situates thought within sustainable tourism theory (mention a few of its aspects), providing a theoretical framework to guide inquiry and interpret the observations and outcomes. The inquiry utilized an exploratory research approach with a descriptive design, employing qualitative methods to gather data from Sweetwaters Serena and Sirikoi Lodge. It examined design processes, strategies, outcomes, and environmental impacts, aiming to understand their role in fostering harmonious interactions. Thematic and comparative analyses revealed critical factors influencing coexistence, such as site location relative to wildlife areas and the thoughtful selection of materials, colours, and activities in ecolodge design. The results emphasized the importance of these elements in achieving successful coexistence, highlighting the intricate relationship between ecolodge design and the integration of human beings and wildlife in shared landscapes. The findings provide valuable guidance on minimizing disturbances, reducing stress on wildlife, and supporting conservation efforts. This research contributes to existing literature by clarifying the link between ecolodge design and human-wildlife coexistence. It offers practical insights for stakeholders, including policymakers, conservationists, the tourism industry, designers, and global bodies involved in mitigating human-wildlife conflict. The study concludes by suggesting future research directions, emphasizing the need to further explore how architectural design influences human-wildlife interactions in safari ecolodges (Insert here some specific issues to interrogate that were left out. Otherwise, it sounds like you are recommending a simple repeat of this same exercise).

KEY WORDS: Coexistence, Human wildlife Conflict, Ecolodge, Safari Ecolodges

DESIGN PROJECT DESCRIPTION:

DESIGN OF AN ECO-FRIENDLY SAFARI ECOLODGE.THE

SITE: The site is located within Laikipia county in Nanyuki town. The site borders and serves as an extension of the Ol Pejeta conservancy which is known for its commitment to wildlife protection, including endangered species such as rhinos and

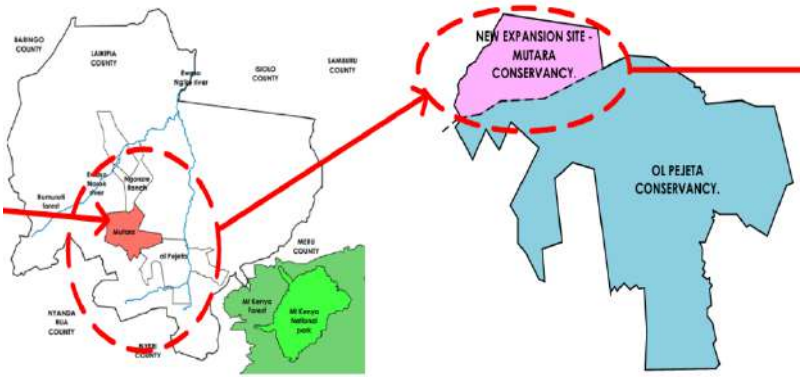


Figure 1: Site location. Source: Adapted and modified from Laikipia, by Africa Geographic, 2015, https://africageographic.com/stories/laikipia/. © 2015 by Africa Geographic.

chimpanzees. It is a 4hr drive from Nairobi and its main gate sits roughly 40 km from Nanyuki along the partially tarmacked Rumuruti road.

Figure 2: Deluxe treehouse room overlooking the river and animal mud pit. Source: Author,2024.

The project delved into the design of a safari ecolodge. The aim of the project was to create an ecolodge that is mindful of wildlife and their critical areas, behaviours and patterns with the aim of ensuring coexistence between the wildlife and tourists. The understanding of wildlife behaviours and patterns was used as the guiding principle in the design of spaces as established from the research on how architecture can be used to promote coexistence. The major spaces considered in the design were: Administrative spaces, accommodations, kitchen and restaurant and recreational spaces.

CONCEPT DEVELOPMENT:

The architectural philosophy adopted is the one of organic architecture by Frank Lloyd Wright, the theme being contextual harmony which refers to adapting architecture to its surrounding. The design inspiration was the site, the site context being that it is a wildlife habitat, it is known for White Rhino conservation, it is bordered by the Ewaso Nyiro River, and it contains predominantly Acacia Trees.

Figure 3: Crown shyness gaps left by vegetation on site. Source: Author, 2024

Crown shyness refers to a phenomenon in which branches of closely spaced trees avoid overlapping creating visible gaps in the canopy. It is prevalent in plants of the same species. Incorporation of crown shyness into site planning helps preserve the existing trees and integrate them into the design, supporting the element of minimum impact on wildlife habitat. This is a major element in ensuring coexistence by avoiding habitat degradation.

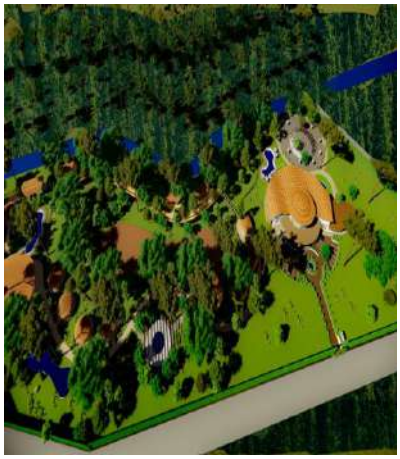


Figure 4; Site zoning from crown shyness gaps. Source: Author, 2024.

THE DESIGN:

Figure 5: Site top view. Source; Author, 2024.

construction of the ecolodge to blend seamlessly with the natural environment. Buildings embrace organic shapes and textures inspired by the surrounding landscape to create a cohesive and visually appealing design that enhances the sense of immersion in nature.

Buildings on critical areas of wildlife have been elevated (treehouses) to avoid impact on wildlife critical areas such as the river which serves as a natural migratory corridor, breeding area as well as

Figure 7: Elevated treetop walkway. Source: Author, 2024.

The design utilized the gaps between tree crowns to inform the layout of the ecolodge. Pathways and communal areas meander around existing trees, preserving green spaces and minimizing disturbance to the ecosystem. Activities like watering areas, dust rolls and salt licks were used to draw wildlife to less critical zones and in this way controlling and creating views. It also features use of locally sourced materials such as wood, stone and thatch for roofing in the

Figure 6: Administration area made of wood wall and thatch roof. Source: Author, 2024.

providing opportunity for bathing and drinking. This elevation from the ground also allows wildlife to continue with movement underneath the buildings, ensuring no disruption to their migratory patterns. The buildings are generally scattered throughout the site, each nestled within its local natural landscape in order to maintain sightlines between trees. Such layouts, allowing guests to feel connected to nature while enjoying uninterrupted views of the surrounding forest. It also creates an illusion of continuity of the horizon for the wildlife.

Figure 8: Ha-ha wall sketch. Source: Author, 2024.

For human security, a barrier called a Ha-ha was used to separate wildlife zones from human zones.

Figure 9: Ha-ha wall on site. Source: Author, 2024.

Prof. Alfred Omenya (PhD)

Prof. Alfred Omenya is an architect, an environmental designer and sustainable human settlements expert. He is Associate Professor and Programme Leader at the Department of Architecture and Interior Design at Kenyatta University, Kenya. He has been the Principal Researcher and CEO at Eco-Build Africa. He is Director in charge of Infrastructure at the AfriFund Capital. He is Adjunct Prof. University of Canberra (Australia). He is the Chairman of the Education, Research and Innovation Committee of the College of Fellows of the Architectural Association of Kenya and a Director of the Board of the International Building Quality Centre (representing developing countries).

He is also a Board Member of International Union of Architects. He has been Associate Professor and Head of School of the Built Environment at the Technical University of Kenya. He previously taught at the University of the Witwatersrand (RSA) and the University of Nairobi (Kenya). Prof. Omenya researches, teaches and consults on climate change, green architecture and sustainable urban development, globally. He has been a lead judge of major architectural competitions globally.

Dr. Wairimu Maina (PhD)

Wairimu Maina is a dedicated lecturer in the Department of Architecture and Interior Design. She specializes in sustainable design, emphasizing efficient resource use in buildings. With a strong background in education, she employs a systems approach to participatory methodologies, promoting inclusive design practices.

Prof. Arch. Paul Mwangi Maringa, (PhD), CBS, FAAK, MKIP, Adjunct Professor of Architecture and Planning, DAID, SEA, KU

Prof. Arch. Paul Mwangi Maringa is the immediate past Principal Secretary for Infrastructure in the Government of Kenya (2019-2022). He previously served as the Principal Secretary for Public Works from November 2015 to March 2017. He later transitioned to the State Department of Transport. In September 2018, he returned to the State Department of Public Works.

Prof. Maringa has over 30 years of experience in public service, academia, and consultancy. He is an Architect and Planner, who holds a Doctor of Philosophy in Environmental Planning from the Jomo Kenyatta University of Agriculture and Technology (JKUAT) and a Master of Arts in Urban and Regional Planning from the University of Nairobi. He trained as an architect at the University of Nairobi where he attained an Honours degree in Architecture.

Professor Maringa pioneered the School of Architecture and Building Sciences (SABS) at Jomo Kenyatta University of Agriculture and Technology (JKUAT) and the Faculty of Architecture and Environmental Design (FAED) at the Kigali Institute of Science and Technology (KIST), where he also served as a Deputy Vice Chancellor Academic Affairs. This Faculty was subsequently re-named as the School of Architecture and Built Environment (SABE) and incorporated into the University of Rwanda (UR). He is a prolific author of research papers, book chapters, research monographs, and book reviews, while also serving as a referee, associate editor and editor in chief of various other scholarly outputs. He has also organized a considerable number of workshops and seminars

Dr. Arch. Rehab Hamdi Elnaggar, (PhD), EEE-Egyptian Engineer Syndicate, Lecturer, DAID, SEA, KU.

Rehab Hamdy Elnaggar is a lecturer, architect, and urban designer with 25 years of academic and professional experience. She has been a lecturer at Kenyatta University since 2021. Dr. Elnaggar began her academic journey by earning a Bachelor's degree (BSc Hons) in Architecture and Urban Design from Ain Shams University in 1997. She furthered her education by obtaining a Master's degree (MSc) from the same institution in 2007 and a PhD from Cairo University in 2015.

Dr. Elnaggar's teaching career spans nearly two and half decades, including her tenure at the Arab Academy for Science, Technology, and Maritime Transportation (AASTMT) from 2000 to 2019, and at Al Shorouk Academy from 2016 to 2019. Throughout these years, she has demonstrated an unwavering commitment to education and the advancement of architectural knowledge.

In parallel with her academic endeavours, Dr. Elnaggar has developed a robust professional practice. Since her graduation, she has designed and supervised the implementation of numerous significant and specialized projects, ranging from hospitals and residential towers to resorts, schools, private residences, showrooms, and a variety of interior design projects. Her dual career as an educator and practicing architect highlights her dedication to both the academic and practical dimensions of architecture and urban design.

Kenyatta University is home to some of the world's top scholars, researchers and experts in diverse fields. The university takes pride in providing high quality programmes that attract individuals who wish to be globally competitive. To achieve this, it has invested heavily in infrastructure and facilities that offer students the best experience in quality academic programmes under a nurturing environment in which our students learn and grow. Kenyatta University is one of the leading universities in Kenya. On the 21st of March 2024, Kenyatta University was ranked No. 2 in Kenya, 38 in Africa and 2230 in the world. According to the Edurank website, the ranking based on research output, non-academic prominence and alumni influence. The University aims to not only to maintain this position, but to also improve further and attain its vision of becoming a world-class university that is committed to quality and relevance. What gives graduates of Kenyatta University a cutting edge over their peers is the University's emphasis on practical hands-on knowledge and the skills training imparted to its students. Towards this noble end, Kenyatta University has established meaningful links with partners in industry, who guide the University on practical, professional requirements which need to be built into learning programmes. As a result, the University's courses give graduates a distinct advantage in the workplace. Many graduates are exposed to new employment opportunities by accessing industrial attachments during their study, or through course related placements

The Department of Architecture & Interior Design's (DAID) is committed to the pursuit of quality through teaching, research and development. It also strives to provide timely services that foster and develop academic excellence in basic and applied research at all levels of study. In this way, it aspires to train practice-oriented manpower, who can contribute innovatively and effectively to social, intellectual and academic development. The department, together with the school of Engineering and Architecture that it is nested in, aims at providing training in the planning, formulation and implementation of built forms, that range from the individual dwellings, communities and cities. The ever-rising demand for dwellings spaces that are sustainable and economically efficient requires learning to the highest levels possible. In line with the University's goals, the Department of Architecture & Interior Design's (DAID) endeavours to continually improve its services, products, processes, methods, and work environment to ensure that each learner receives the highest quality service or product at the committed cost and on time. Sustainability is the underlying principle within the learning curriculum in the Department's green based philosophy. The programme is based on the understanding that the skills required for designing the built environment come from a broad education that draws on science, technology, and humanities within the totality of natural environmental systems. These then are complemented with the additional skills of thinking spatially. Learners in the Department are inducted into these skills through focused practical learning. This is done through studio portfolio instruction that relies on designs that simulate real life settings. The Department has a good complement of qualified, vibrant ,full time and part time ,local and international staff. These staff present with a mix of staff that are intensely pursuing practicing in industry and others whose primary drive is instructional and research scholarly work. Learning here is well supported with adequate learning spaces in form of studios, wood & metal workshops, lecture rooms, computer laboratories and libraries.

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