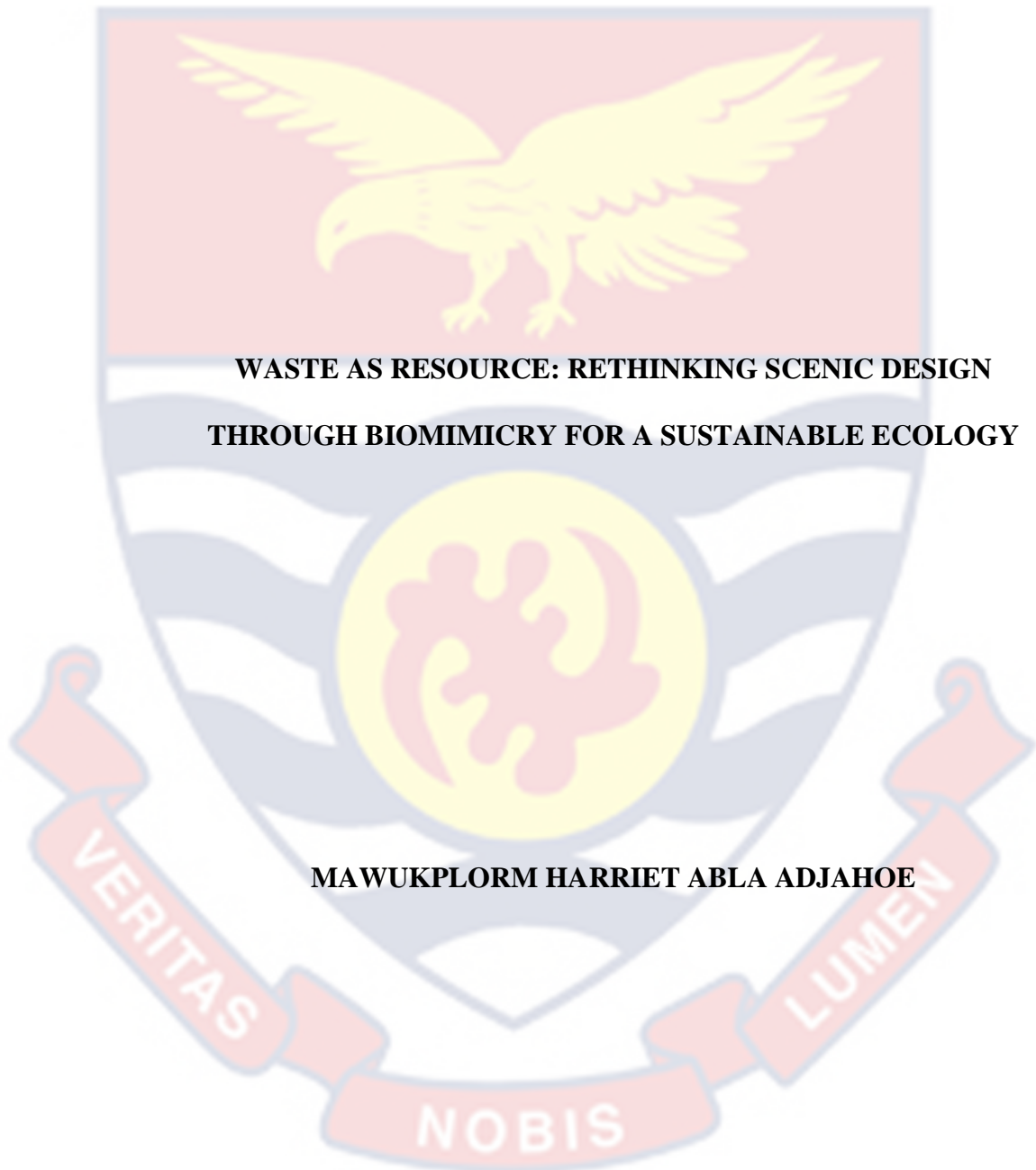# UNIVERSITY OF CAPE COAST

WASTE AS RESOURCE: RETHINKING SCENIC DESIGN

THROUGH BIOMIMICRY FOR A SUSTAINABLE ECOLOGY

MAWUKPLORM HARRIET ABLA ADJAHOE

2022

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University of Cape Coast

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THROUGH BIOMIMICRY FOR A SUSTAINABLE ECOLOGY

BY

MAWUKPLORM HARRIET ABLA ADJAHOE

This thesis is submitted to the Centre for African and International Studies of

the Faculty of Arts, University of Cape Coast, in partial fulfillment of the

requirements for the award of Doctor of Philosophy degree in African Studies.

December, 2022

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature: …………………..   Date: 15/04/2024

Name: Mawukplorm Harriet Abla Adjahoe

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: ……………..   Date: 15/04/2024

Name: Prof. Victor K. Yankah

Co-Supervisor's Signature: …………………..   Date: 15/04/2024

Name: Prof. Dr. Julius Heinicke

ABSTRACT

Theatre performances have gradually gained recognition as an essential tool for information, education and entertainment. During such performance, set design constitutes a major indication for the overall understanding of the story, and spectacle. The general observation has been that these sets do not last long due to wear and tear from construction and striking down. In the context of global sustainability talks, however, designers have not explored much with environmentally-friendly materials outside of the defined conventions of set designing and building.

Employing an Arts-Based Research design, with theatre as the mode of enquiry, I explored the appropriation of waste materials for the purposes of designing scenery for theatre performance. Data for this study was gathered on two levels: generating data – through theatre performance; and collecting data – through interviews of some selected Ghanaian set designers for an assessment of the production process and output. The qualitative analytic tool of deductive interpretivism was used in aid of providing explanation for the outcomes.

The findings revealed that the output of waste designing is highly dependent on the sophistication of technology used. The method of remolding the waste plastics particularly of grades low-density polyethylene (LDPE) and polypropylene (PP) by melting was unsustainable as it posed a health hazard of emitting toxic gases into the atmosphere. In the end, water and beverage bottles belonging to grade polyethylene terephthalate (PET), and water sachet plastics of grade LDPE were determined as conducive for the project based on the facilities available at the time of implementation.

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May God bless everyone.

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DEDICATION

To my family.

And to all who love and appreciate the quest for knowledge.

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LIST OF ACRONYMS AND ABBREVIATIONS

ABR: Arts-Based Research

CE: Circular Economy

CEYD: Community Education and Youth Development

CNC: Centre for National Culture

CPA: Cyclical Pattern of Activities

CYCC: Community Youth Cultural Centre

EPA: Environmental Protection Agency

ETS: Efua Theodora Sutherland Studio

FAO-UN: Food and Agriculture Organization – United Nations

HDPE: High-Density Polyethylene

LDPE: Low-Density Polyethylene

MLNR: Ministry of Lands and Natural Resources

MoTAC: Ministry of Tourism, Arts and Culture

NCC: National Commission on Culture

PETE/ PET: Polyethylene Terephthalate

PP: Polypropylene

PS: Polystyrene

PVC: Polyvinyl Chloride

SDG: Sustainable Development Goals

UN: United Nations

UNGA: United Nations General Assembly

WTO: World Tourism Organization

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CHAPTER ONE

INTRODUCTION

Background to the Study

Culture of performance in Ghana

Scenic design and construction has become a significant component of the performance arts interface in Ghana. In dance, theatre and music performances within the academic sphere as well as in the industry, a number of trained, trainee, and amateur designers practice their creative skills in simulating natural spaces for theatre productions. Whilst this venture has become a source of livelihood for these designers, Mother Nature suffers depletions of her forest reserves and the destruction of her land and water bodies.

Why is this so? In implementing scenery design, a lot of the materials are majorly sourced from wood and other related materials. Meanwhile, during the production process, waste is generated to add to the unending existing heaps of non-biodegradable waste that plague the many communities in Ghana. This non-biodegradable waste in the form of plastic and glass has in some jurisdiction, become the raw materials for production where it is recycled to serve the purpose of the designs. In this light, and more importantly, with the call on all nations to attend to the climate change phenomenon as a matter of urgency, scenic designers in particular, and the performing arts in general is emboldened to attempt other process of production that will be deemed more sustainable.

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When the National Theatre Movement was founded in Ghana in 1956, one year before the country's independence, it's goal was to create a theatre form that would draw its life and authenticity from the people's traditions (Sutherland, 2016). This called for members of the literary drama fraternity to adopt and create concepts that promoted the Ghanaian culture, beliefs, arts, religion, and values. The national theatre movement was spearheaded by the Ghanaian literary prodigy, Efua Theodora Sutherland, who had by then embarked on experimentations of Ghanaian indigenous performance concepts with a blend of the learned European performance tenets.

Governments were ready and equipped to promote the National Theatre Movement agenda such that during Kwame Nkrumah's regime the foundations of the School of Performing Arts was laid as a component of the academic curricular at the Institute of African Studies in 1962. Then in 1992, during Jerry John Rawlings' regime, the National Theatre edifice, a state-of-the-art theatre house, with support from the then Chinese government, was built in Accra.

Discussions on the subject of development of theatre in Ghana in scholarship is comparatively sparse (Asiedu, 2014; Banham, 1995; Cole, 2001; Gibbs James, 2009; Kerr, 1995; Sutherland, 2016; inter alia). Regardless of this, according to Charles Angmor (1978), a Ghanaian literature critic, drama in Ghana evolved from both indigenous Ghanaian verbal art and western dramatic art. Angmor distinguishes two types of modern dramatic expressions in Ghana: operatic drama and literary drama.

He further categorizes operatic drama into three types: cantatas of Christian societies, comic plays of itinerant musical bands known as concert parties, and folk operas that are imitations of European operas. Angmor's classification of *operatic drama* is equally considered as the beginning of *theatre* in Ghana as it embodied the elements of the Western performance art type. The twentieth-century popularity of this operatic drama inspired writers such as Patience Addo and Derlene Clems, whose plays *Company Pot* and *Scholarship Woman*, respectively, were broadcast by the BBC in 1972 (Banham, 1995).

Oral history and authoritative records by scholars such as Sophia Lokko, J. H. Nketia, A. A. Opoku, J. E. K. Agovi, and Martin Owusu contend that even before the classification of operatic drama and literary drama, Ghanaian tradition and culture are rife with ritualistic initiations, ranging from birth to death, with a plethora of initiation processes at every stage of life in between. These ritualistic initiations, as well as others, were marked by actions that encompassed both the definitions of drama and performance. As has been aptly discussed by (Lokko, 1980),

> Long before the arrival of European culture in the
> fifteenth century, Ghana enjoyed a rich culture of
> pageantry in which gold ornaments and iron played
> prominent parts. The cults of iron and gold were the
> foundations on which societies were organised; the
> gold cult, handed over from mother to daughter,
> embodied the arts of drama, music and dance, which

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mothers sought to pass on as richly as they could. (p. 309)

The rich, *au naturel* music, drama, and dance within the Ghanaian setting predate the sophisticated aggregation of the Western sense of Performing Arts, and were an integral part of social life, reflecting the social, cultural, political, and philosophical values of a community. Collectively referred to as *agorɔ/agor* by the *Akans*, *fefe* by the *Ewes*, which means *play*, these traditional arts adopted the symbolic and practical use of costumes, ornamentation, and religious objects, enhancing the presentation of the performing arts, bolstering political stature, and strengthening religious life (Adjahoe, 2017; Asiedu, 2014; Salm & Falola, 2002; Owusu, 1983; Nketia, 1969). A reflexive component of this art of *play* is the art of story-telling. The reflexivity of story-telling lies in its ability and possibility to embody dancing, singing, dramatization, narration, etc, which are, in their own rights, individual elements of the concept of 'playing'.

Within the Ghanaian indigenous sense, the art of story-telling, or *kodzi* in Akan and *glitoto* in Ewe, was an oral tradition through which education in our cultural values, beliefs, religion, inter alia, were passed down from generation to generation. Tamakloe (1975, cited in Asiedu, 1999, p.4) asserts that it was of vital national importance and concern to teach, educate, and instill religious, moral, political, and civic ideals in the youth. As a result, story-telling, dancing, and music were used to achieve the goal, the art encapsulated all the elements engaged in the process of play-making namely, dialogue, singing, dancing, clapping, mimicry, story,

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audience, chants, participation, among many others, and was thus named 'storytelling' (Addo, 2013; Asante & Edu, 2018; Mireku-Gyimah, 2018; Omotoso, 1978; Oso, 2021). Participation, morality, and social control were the foundations of this cultural form and performance of the art was done within a found space.

Evidently, the advent of European engagement at the beginning of the fifteenth century penetrated every area of Ghanaian society, including the arts and performance, through a rather culturally biased exchange. One of the consequences of colonialism is 'Western' education. Although it offers other benefits, Western education has had a greater impact on the extinction of many indigenous cultures. The distinctive yet widespread African performance culture of story-telling, which has been superseded by or is being replaced by what is known as 'theatre', is one of these near-extinct or near-dead indigenous activities.

Stage design, costume and makeup, lighting design, stage management, directing, sound design, and so on, are all associated with this 'new' performance culture. Unlike the participatory art of storytelling, which considers the natural occurring environment (i.e., town squares, on the compound, under a moonlit night, etc.) as its setting, the stage, which is meticulously planned and decorated, separates the audience from the performers in the practice of theatre.

Given that there was no proper documentation of the story-telling tradition, and with people losing interest in indigenous activities, the teaching and learning of foreign practices overshadowed the Ghanaian cultural form (Losambe & Sarinjeive, 2001). The early literary dramatic

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writings, although served in a capacity of forerunning documentation of theatre in Ghana, were inspired by European concepts and beliefs. This may be seen in works such as Kobina Sekyi's *The Blinkards* (written in 1915 published in 1997) and Ferdinand Fiawoo's *The Fifth Landing Stage* (formerly *Tɔkɔ Atɔlia*, written circa 1938/1940 and first published by the Achimota Press in 1942 and again by Sedco in 1983).

The structural composition of these premier documentations deviated from the usual oral, participatory, semi-spontaneous, quasi-improvisational elements that defined traditional story-telling to one that was detached from the audience and had to do with robust rehearsing before the performance, despite the fact that they were originally captured in the local languages, namely Fante and Ewe. Ferdinand Fiawoo's play was inspired by Ewe storytelling traditions as well as European theatrical traditions (Gibbs, 2009).

The advent of technology and its attendant impact are essential topics to address while discussing the evolution of Ghanaian theatre from an oral tradition to a literary one. The use of lighting, sound, and the minimalistic set demonstrated the level of technological innovation in the Concert Party performances (Adjahoe, 2017; Cole, 2001). The Concert Party tradition began in the early 1900s as a result of the urbanization and westernization processes. Using "expressive resources of Ghanaian historical culture, including folktales and songs, riddles, proverbs, clothing, political symbolism, ceremonial, magic, and religious ritual" (Bame, 1985, p. 168), this popular theatre drew influence from African indigenous dramatic traditions. Storylines, on the other hand, rarely, if ever, dealt with

pre-colonial issues, instead focusing on current pressures in Ghanaian culture.

The popularity of this genre hinged on society's acceptance, liking, and attendance of the shows, due to the nature of the traveling theatre. Its social roots were not in elite or privileged minority subcultures, but in the intermediate and agricultural sectors, as well as the working class, and it had a significant influence on other performing arts and cultural forms (Cole, 2001). Between the late 1960s and 1970s to early 1980s, the Concert Party tradition nearly collapsed due to the numerous curfews which were consequences of coups d'états and attempted coups d'états, coupled with the economic recession.

At that time, what used to be a vibrant traveling theatre was relegated to once-in-a-while event for troupes that were bold to stand the trying times. However, by the late 1980s, activities surrounding performances and the Concert Party were revitalized, and by 1993, Concert Party had become the main attract.. force for audiences at the newly constructed National Theatre which had been commissioned in December of 1992 in Accra (Adjahoe, 2017; Cole, 2001).

Efua Sutherland was also instrumental in the development of literary drama and theatre in Ghana through her numerous plays written for children and adults; her establishment of "The Ghana Experimental Theatre" – a program based on storytelling art in Ghana; the construction of the Kodzidan at Atwia Ekumfi in the Central Region (circa 1960); and the Ghana Drama Studio (built with the assistance of the Rockefeller

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Foundation in 1961 in Accra). It was demolished in 1990 to make way for the National Theatre's construction but was reconstructed in 1993 at the University of Ghana's School of Performing Arts. Efua Theodora Sutherland Drama Studio – ETS Drama Studio).

In 1962, the University of Ghana introduced the performing arts as an academic program in accordance with this Theatre Movement. The Institute of African Studies at the University of Ghana incorporated theatre, dance, and music into the collegiate curriculum during the Kwame Nkrumah government. The Theatre program was expanded in 1991 with the addition of technical courses - set, sound, light, and costume – to meet the growing demand for technical experts to staff the newly constructed theatre structure.

Scenery or set design gained traction in this space and during this time period. The usage of new materials made of wood, which are mostly sourced from forest reserves, has dominated the practice of scenic design and construction in Ghana since then. This would not have been a major issue in today's era, had it not been for the overuse and misuse of our natural resources, coupled with the contamination of the environment with a variety of non- biodegradable garbage, which has resulted in the climate change phenomenon.

Arts and the environment

Environmental issues, climate change, and climate action have gotten a lot of attention around the world, with countries changing and

implementing policies to either heal the earth or prevent further deterioration. The United Nations (UN) defines climate change as a natural process in which temperature, rainfall, wind, and other elements change over decades or more (United Nations, n.d.). According to the UN, these changes are primarily due to human activity and have resulted in warmer and colder temperatures than were experienced during the pre-industrial period.

Human activities such as burning fossil fuels by driving cars with gasoline or heating a building with coal, clearing land and forests, and using landfills for garbage all contribute to the release of greenhouse gases into the atmosphere. Furthermore, major emitters of these gases include energy, industry, agriculture, and waste disposal. As a result, the earth is enveloped in a thick blanket of gases that trap heat from the sun, causing atmospheric temperatures to reach extremes. Carbon dioxide and methane are two examples of greenhouse gases emitted by the aforementioned human activities, and according to the UN, they are at their highest levels in two million years and are still rising causing the earth to be 1.1°C warmer (United Nations, n.d.).

While it is critical to discuss climate change in its entirety, it is nearly impossible for a single research activity to address all that embodies this phenomenon. As a result, this study advances its argument based on deforestation and waste disposal and identifies ways in which art as a cultural item can be explored in dealing with these environmental hazards.

Humans thrive in a naturally balanced environment in which they breathe oxygen and exhale carbon dioxide (CO_2), which is then absorbed by

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plants and trees. According to the growing literature on forests and carbon reservoirs, tropical forests serve as an important carbon sink, containing forty- six percent (46%) of total carbon in the terrestrial biosphere, with fifty-eight percent (58% in tropical forest vegetation, forty-one percent (41%) in soil, and one percent (1%) in litter. Furthermore, tropical forests absorb nearly twenty percent (20%) of the carbon dioxide produced globally by industrial emissions and land conversion. As a result, any form of destruction, by way of burning or felling, or reduction in the area of these forests will result in a significant increase in carbon dioxide concentration in the atmosphere (Cavaleri et al., 2015; Chambers et al., 2001; Chevalier et al., 2022; Soepadmo, 1993).

According to the UN Food and Agriculture Organization's (FAO-UN) 2020 Global Forest Resources Assessment, the world has lost one hundred and seventy-eight (178) million hectares of forest since 1990, an area roughly the size of Libya, with an annual estimated loss of 4.7 million hectares from 2010 to 2020. The tropical ecosystems have been especially harmed by rampant deforestation, which has negatively impacted biodiversity hotspots. In defining deforestation as the "conversion of forested areas to non-forest land use or the long-term reduction of tree canopy cover […]" (Tejaswi, 2007), the FAO-UN captures a broader classification to imply both the conversion of forest to non-forest, as well as degradation that reduces the forest cover.

Literature on environmental studies lists high rural and urban population pressure, high demand for fuelwood, poor logging practices,

poor agricultural activities, cocoa farming, legal and illegal mining activities, demand for forest products, and urbanization (community expansion) as causes of deforestation in Ghana (Acheampong et al., 2019; Amoah & Korle, 2020; Appiah et al., 2009; Baumgartner, 2019; Drigo, 2005). Wood sourced from these forest reserves is used in a plethora of activities ranging from industrial to domestic purposes.

The demand for forest products extends beyond tables, chairs, cupboards, wardrobes, and shelves, to include wood-based artistry used as spatial ornamentation and for cultural and artistic consumption. The presence of wood promotes the creation of creative and performative art. For example, in Ghanaian societies, indigenous drum, and dance ensemble, particular trees are felled to carve the body of the drums. The choice of trees for drum-making, for instance the *Atumpan* drum, is more religious-based as these societies believe that these trees are "powerful and malignant […] and to be potentially vindictive and therefore the need to pour libation before they are felled" (Kemevor, 2014, p. 60).

Aside from its malleability and durability, the wood used by craftsmen in sculpting certain artifacts and making other creative constructions has a similar spiritual description. However, for the sake of tourism and economic gain, Ghanaian traditional artistry is divorced from its cultural context and mass-produced to meet the growing demand for such items by tourists and other groups of people.

A trip to the Centre for National Culture, in Accra, which houses the biggest art exhibition centre, (popularly called Arts Centre) reveals a

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massive display of wood crafts that have been purposely made for sale. The wood crafts include awe-inspiring masks and dolls (the *Akuaba* dolls), drums, traditional stools, and remarkable sculptures that draw inspiration from Ghanaian indigenous symbols. Within this same space also exists performance spaces designated for hosting theatrical events. With the establishment of numerous privately owned production houses over the last decade, theatre activities in Ghana's arts industry have steadily increased.

A positive reflection of the Ghana National Theatre's management has been the agreement or collaboration with these privately owned theatre companies to rent out the performance auditorium at an extremely low cost. The core mandate of the National Theatre is to "make the Performing Arts the anchor for the preservation, promotion, and development of Ghana culture" (National Theatre, Ghana, n.d.). Among its values are: partnership and collaborations, uniqueness of Ghanaian culture, and accessibility.

It is deducible therefore that the collaboration between the institution and other privately owned theatre companies is to concretize the values underpinning the existence of the National Theatre. This has encouraged the staging of performances at the aforementioned venue twice a month on average. Similarly, theatre performances in academic institutions have more than doubled due to an increase in student enrollment and a surge in interest in the performing arts.

Churches are not left out either. Stage performances in Ghanaian churches have increased, with the peak occurring during festive occasions such as Easter and Christmas. Nonetheless, an increase in theatrical

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performances in Ghana invariably increases the demand for wood for the creation of scenery for these productions. There is undoubtedly a significant amount of waste generated during the construction of the scenery for these numerous performances, adding to the existing heaps of waste, particularly plastics, found in landfills and clusters of dumpsites dotted across both urban and rural communities nationwide.

The World Bank's 2018 report on waste production and management claims that "waste generation is a natural product of urbanization, economic development, and population growth," and presents troubling statistics that demand immediate attention. According to the report, *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*, a total of 0.74 kilograms of waste per capita is generated globally every day. Waste generated was an estimated 2.01 billion tonnes in 2016 and is expected to increase to 3.4 billion tonnes by 2050. Food and green waste account for more than half of waste generated in low and middle-income countries, while recyclables account for a significant portion of waste streams, ranging from 16 percent paper, cardboard, plastic, metal, and glass in low-income countries to about 50 percent in high- income countries.

The tendency is to believe that lower- and middle-income countries, such as Ghana, have better statistics than high-income states. Nonetheless, the report reveals that high-income countries are better at waste separation. Furthermore, while the East Asia and Pacific region produces the most waste in absolute terms, at 23%, and the Middle East and North Africa region produces the least, at 6%, waste is growing the fastest in Sub-Saharan Africa, South Asia, and the Middle East and North Africa regions, where total waste

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generated is expected to roughly triple, double, and double by 2050, respectively (Kaza et al., 2018). In this era when climate change dominates discourses, it is critical for nations to pursue better solutions.

Waste generation and deforestation are unavoidable byproducts of industrialization, population growth, and urbanization. Deliberate efforts by nation-states and appropriate stakeholders to reduce waste generation and implement better waste management policies will not only significantly reduce carbon footprints from landfills, but will also promote better health and environmental conditions. The inability to address these issues using all available means will militate against the achievement of the 2030 Sustainable Development Goals (SDGs).

The United Nations General Assembly (UNGA) adopted the 2030 Agenda for Sustainable Development in September 2015, which is said to be the most ambitious and comprehensive development agenda ever adopted by the world's countries. It lays out a bold vision for both developed and developing countries to achieve development balance in the environmental, social, and economic dimensions.

Its adoption has heightened awareness of the need to move away from siloed approaches and toward "navigating multidimensional, interconnected, and increasingly universal predicaments" (UNDP, 2020). Recognizing the diverse responses required to address the world's multifaceted challenges in the 2030 Agenda provides an ample and largely untapped framework within which arts can contribute to sustainable development. SDGs 12 – responsible consumption and production; 13 –

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climate action; 14 – life below water; and 15 – life on land – are among the primary goals identified as aligning with this research.

With only eight years to achieve the lofty 2030 Sustainable Development Goals, the UN Secretary General, Antonio Guterres, sounded the alarm for the need to expedite action on climate change at the recently held UN Climate Change Conference in Glasgow (COP26), from October 31 to November 12, 2021, adding that the climate action struggle requires all hands- on deck because it is everyone's responsibility. In light of this, theatre and the performing arts can be viewed as active agents of change for the sake of a better world.

Theatre as an agent of change

People frequently misinterpret theatre as merely an entertaining endeavor, which is why children are encouraged to pursue hard and soft sciences, which are considered serious activities. Drama and theatre, on the other hand, have proven to be effective tools for education, communication, and socialization, as well as entertainment. For example, in medieval Europe, when Christianity was at its peak and only the wealthy could afford to read the Latin Bible, theatre was used to teach and spread Christian ideology (Brockett, O. G., & Hildy Franklin J., 2008; McConachie et al., 2016; Westlake, E. J., 2017).

Ghanaian indigenous drama has been used on occasions to whip, correct ills, criticize, instill values and enforce knowledge systems of particular societies. (Asante & Edu, 2018; Kerr, 1997; Omotoso, 1978). The

effect of the correctional force of drama, especially within the Ghanaian context, was felt in the communal engagement of the story teller, the one whose story is being told, the one who was a witness, the one listening to the story, and the story itself, so that shaping even an individual was a community affair. This implies that the stories of the drama were not directed only towards the offender and/ or the offended, but equally served as a learning tool for members of the community to rely on in the case of similar future occurrences of such vices.

Jerzy Grotowski's book *Towards a Poor Theatre* rejects theatre as mere entertainment, arguing that performers should use their roles as analytical mediums in examining and uncovering the essence of existence through minimalistic performance strategies (Grotowski, 2002). Against this backdrop, people have used theatre in the form of propaganda (agitational propaganda or agitprop for short), development, and social protest to cause a shift in a society's mindset. An example is the 'Mask Up' campaign by the National Commission on Culture (NCC).

In 2020, when the world was at the peak of its record of the Sars-Cov- 19 (Covid-19), a significant portion of Ghana's population was still in doubt about the reality of the deadly virus. Using theatre as a social protest and educative tool, the NCC embarked on a nationwide tour on the need to protect ourselves against the deadly virus. The NCC visited many basic schools to educate the pupils on the steps to take to guard against acquiring the virus. In this instance, therefore, the NCC used theatre to change the mindset of these children who were initially unwilling to even wear nose masks, to become campaigners for observing the Covid-19 protocols.

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Theatre has also created a space for creativity and innovation as is reflective of the Italian Renaissance in the transition from the drab two-dimensional representation to a full-life three-dimensional representation, giving the practice a touch of realism. Likewise, in Ghana, some stage designers have had to experiment with other materials particularly when the material in use did not support the design framework, or they needed to implement a certain design concept, or just plainly to cut down cost. Materials such as foam, polystyrene, alucobond (an aluminum plate) have been tried for design purposes.

Although some of these designers have explored other materials, the core of the argument remains that wood has for many years and counting maintained its position as the premier consult of material for theatre stage designers. In effect, while increase in cultural activities contributes to revitalizing old and forming new identities, certain practices within these activities negatively impact the SDG goals. With the call to adopt practices that militate against climate change, however, these materials still maintain unfavourable features parallel to the concept of sustainability. It is important, therefore, to reconsider the relationship between the arts (and for that matter theatre) and nature and how the arts impact nature – negatively or positively –likewise how nature impacts the arts.

Statement of the Problem

In the scholarship on scenic design and construction for the theatre,

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writers have majorly concentrated on the history, principles, modes, and kinds of scenic design (Crabtree & Beudert, 2012; di Benedetto, 2012; Edu, 2001; Gillette, 2013; Gloman & Napoli, 2007; Sanders, 2018; Wilson, 2015, 2020 inter alia). Most of these scholars have drawn examples from productions held within their geographical locations to contextualize the materials (usually wood, metal, and plastic); the process (of material acquisition, building strategies, painting styles); artistic modes (realism, naturalism, expressionism); and the product to depict the concept of the director an designers.

The literature is however silent on how scenic design is used or can be used as a tool in effecting environmental change particularly in this dispensation of climate change and its attendant harsh effects. Perhaps, this is because the practice of the craft in projecting environmental protection and preservation is equally lacking, thus creating a gap in the practice of scenic design. The gaps that this study seeks to fill are on two levels: artistic or practical; and literature. This study seeks to explore possible alternatives in terms of methodology – materials and processes – in designing and constructing scenery for the theatre. This will ultimately contribute to expanding and building the scholarship on scenic design particularly in terms of its advocacy power in line with the SDGs.

Objectives of the Study

The overarching objective for this research is to find (an) alternative material(s) that could equally serve as resource in designing and building

the stage for a performance. The aim here is to contribute to solving the menace of non-recycling, non-reusing, and non-repurposing of materials that we would consider as waste. The subsets of the objective of this research are to:

a) Investigate how the practice of set design in Ghana is un/sustainable;

b) identify ways in which set designers (can) contribute to creating an eco-friendly future;

c) discover and explore ways in which waste materials can be used for creating stage set;

d) experiment with the adaptation of the concept of biomimicry as a basis for designing with 'waste' materials

Research Questions

In order to achieve the goal of this study, I posed the following research questions:

a) By what method(s) is/ are the practice of set designing in Ghana un/sustainable?

b) In what ways can set designers contribute to the global pursuit of creating an eco-friendly future?

c) How can waste materials be adapted into creating set designs for performances?

d) In what way is the concept of biomimicry adaptable as a basis for set designing with 'waste' materials?

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Purpose and Significance of the Study

The main purpose of undertaking this research is to explore and experiment with possible alternative ways of designing and implementing sets for performance(s). Set design has gradually progressed from a bare stage through two-dimensional design to three-dimensional design using wood as its main source of material. Nonetheless, set design, at least in Ghana, is yet to actively engage the global discourse on sustainability in its diurnal practice.

With the earth increasingly becoming depleted of its trees and natural cover, coupled with indiscriminate disposal of waste on the land which has in some ways necessitated open incineration, it is only necessary to engage in shift scenes from dependency on natural resources, to recycling what has already been produced in abundance. This is because some of this land waste is also washed off into the various water bodies, thereby increasing water pollution and creating a hazardous environment for aquatic life. Instead of relying on the usual wood for construction, this research seeks to experiment with otherwise 'waste' materials ranging from organic to inorganic, by recycling them to design and implement a more sustainable and eco-friendly scenic design.

The significance of this study majorly lies in the opportunity to create a model for designing with waste that would serve as a template for designers across the performing arts in general, and more specifically for scenic designers within the theatre field. For the reason that, the assistance of a Molecular Biologist and an Engineer was sought, this study sets the

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stage for the development of an interdisciplinary/ transdisciplinary research in the theatre field. In terms of sustainability, this study foregrounds the application of the theories of sustainability within the theatre sector, specifically scenic design to influence a change in the narrative of designing for stage at least in Ghana.

Delimitation

The exploration of waste materials to serve as resource for scenic design and construction in this research does not include designing stage properties. The focus of this study is limited to only the set which serves as the background against which the play is performed.

Organization of the Study

This thesis is divided into six chapters. The first is the introductory chapter and captures the background and motivation for embarking on this research, as well as the lacuna that this study has identified and seeks to fill. In this introductory chapter also, the objectives that guided the study, and the attendant questions which were generated to help find answers to the gap identified, are outlined. In the second chapter, I review literature that is relevant to the discussion and analysis of the study. The attempt at discussing existing literature is to answer questions on the empirical, theoretical, and conceptual structure of the research.

The third chapter details the methods that were followed to achieve

the objectives of the study. It discusses the general research methodological paradigm and the specifics, including tools, materials, and processes employed in arriving at the research findings.

The fourth and fifth chapters bear the crux of this thesis, in that the analysis and discussion of the research findings are captured in these two chapters. The analysis of the findings is characterised under two themes, namely: materials construction as a performance of sustainability, and the reflection of production (set, and play) on sustainability. The analysis takes on a reflexive form to correlate with the literature discussed in the previous chapters and is supported with illustrations in the forms of sketches, detailed mechanical drafting and pictures.

Chapter six is the concluding chapter which summarizes the entire write up and discusses the conclusion of the findings. In this chapter, recommendations for future research are made based on the findings. For the fact that the research was practice-led, recommendations are also outlined for scenic designers in the practice of the craft, as well as for the teaching of the craft.

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CHAPTER TWO

REVIEW OF LITERATURE

Introduction

In this research, I seek to establish that the practice of scenic design for theatre performances in Ghana bears little or no resemblance to an eco-friendly or green theatre practice, and that there is the need to negotiate other materials as major sources of fabric for the practice of the craft. While there is a dearth in literature on the concepts of waste designing through the use of biomimicry, and applying biomimicry in designing for theatre, in this chapter I review literature on how these concepts have played out in other fields of study and draw similarities in theatre as a whole, and scenic design in particular. Thus, discussions on scenic design in this chapter dwells on its principles of scenic design as a worldwide phenomenon from a global historical perspective, narrowing it down to the context of Ghana and the evolution of the practice.

The specific topics explored in this chapter center on the following criteria, drawing on examples of art practices from around the world: scenic design and its modes, designing with waste, and sustainability and sustainable development goals. Furthermore, this chapter maps out the theories that characterize the data analysis and follow-up conversations. The overarching theory identifiable in this thesis is the sustainability theory under which such supportive theories as the theory of Circular Economy (CE), the Biomimicry theory, and the Cultural Sustainability theories are

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discussed. Then in the concluding part of this chapter, I proceed to develop a conceptual framework that correlates the notions revealed in this research.

Defining the Scenery Design

Set or scenic design does not exist as an isolate, but finds its purpose, function and strength within the boundaries of music, dance, and especially for this study, theatre performances. If scenic design is divorced from the contexts of theatrical performance, it would be considered as a visual arts installation. Some writers have suggested the appositional and diverging features between visual arts and theatre. Wilson (2015), consequently, has described theatre as being transitory and fluid, features that are common to all the performing arts elements. This fluidity, he says, is what sets theatre apart from literature and visual arts.

He argues that a piece of sculpture, a novel, or a book, remains unaffected in the face of change because its nature is to freeze a moment in time into an object, while theatre, which has the preoccupations of human beings as the center around which other elements orbit is considered an event. He quotes Bernard Beckerman in what seems to be a detailed description of the transitory nature of theatre as against the rigidity seen in visual arts and literature:

> Theater is nothing if not spontaneous. It occurs. It
> happens. The novel can be put away, taken up, reread.
> Not theater. It keeps slipping between one's fingers.
> Stopping, it stops being theater. Its permanent

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features, facets of activity, such as scenery, script,

stage, people, are no more theater than the two poles

of a generator are electricity. Theater is what goes on

between the parts (p. 10).

Wilson (2015), draws the line of similarity between these creative art

outputs at the plays being often printed in books, like literature, that "can be

studied in a classroom in terms of imagery, character, and theme". He

concludes however that this form of study is in "preparation for or a follow-

up to the experience", and even when the play is read in book form, it is

essential to create an imagery of the other aspects in our mind's eye.

In his study Theatre and installation: perspectives on Beckett,

(Tubridy, 2018), while focusing on the alluring effect of installation art and

the significance site selection plays in selected stage adaptations of Samuel

Beckett's drama for theatre and radio, investigates the intersections between

drama, live performance, and the visual arts. In his analysis, Tubridy dwells

heavily on Ilya Kabakov's *Total arts installaion* to reiterate the agency and

subjection that art installation and theatre share as a commonality through

their process of creation and audience engagement, configuring "both as a

social and an interpersonal dynamic", which are equally a "fundamental

condition of installation art because of the immersive quality of the viewer's

experience, […]" (p. 80).

He draws a parallel between theatre and arts installation through

contextualized examples of artists, and theatre practitioners such as Samuel

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Beckett, Tania Bruguera, Ilya Kabakov, and Judith Wilkinson. Like Juliane Rebentisch who regards theatrical and non-theatrical art as the same because for her "there is no art that is not theatrical", Tubridy draws a parallel between installation arts and theatre through his conclusion that the selected productions studied extended "the boundaries of theatre and engage with modalities of installation art that lend new perspectives to contemporary theatre. The intermedial condition of contemporary art, performance practice, and theatre- making opens a new site for the production of theatre and of art" (p. 81).

Considering these two different standpoints on the relationship between theatre arts, literature and visual arts installation, how is scenic design defined in broader terms, and how is scenic design contextualized in my study that seeks to draw intersections between theatre and activism?

Like Johnson (1968) says of Shakespeare's plays that "his drama is the mirror of life", I say that the same can be said of scenic design. This is because as human beings, we live in houses. Whether they are made of clay, wood, concrete, bamboo; human beings have a structure that first and ultimately provides shelter or accommodation. Depending on the social class, occupation, and/or personal preferences of the inhabitant, an array of furniture and decorative items furnish these structures. In mirroring this same life on stage then, I have realized from my years of experience that it behooves the set designer to recreate a semblance of such or any architecture on stage to carry the audience along in the shared experience of the performers.

The practice of designing has been the result of a clear collaboration between all members of the production team (Crabtree & Beudert, 2012; di Benedetto, 2012; Gillette, 2013; Gloman & Napoli, 2007; Sanders, 2018; Wilson, 2015, 2020). This has equally been my observation in my progression from student designer to professional theatre designer. A scenic designer cannot explore his ideas without the director's and his fellow designers' input and influence – costume, light, and sound. The same can be said of all aspects of this artistic practice, such that no member can do individual work in the comfort of his own home and then impose the results on his fellow members. A number of unfortunate incidents should be expected in this case, ranging from color clashes caused by mismatched colours between the set, costume, and light; to restricted or cumbersome entries and exits caused by differences in the sizes of the costumes and the sizes of the doorways and windows (in rare cases where a performer employs the window as a door), among many others.

This kind of cohesion is what has earned this practice the tag of a "collaborative art" (Sanders, 2018). This is because the imagination of the playwright is rendered not exclusively by the director, but the absolute result of the artwork is resulted from a closely-knit collaboration between the technical and design personnel. Theatre scenery then becomes the manifestation of the imagination of the playwright and the designer with the influence of other designers for the attainment of a unified and harmonious presentation.

Gillette (2013) sets the tone for describing the essentials of scenic design in the 7th edition of his book *Theatrical design and production: An*

introduction to scenic design and construction, lighting, sound, costume, and makeup. He asserts that scenic design for a theatre production feeds chiefly on the dictates of the playwright which is either visibly outlined or has to be deduced from the dialogues and the stage directions. This is then supplemented or better still, complimented by the artistic prerogative of the designer in collaboration with the director and other designers. Groves (2010, p. 13) equally describes the visible collective impression of a scenery as "the fruit of much work, consisting of learnt skills, precise activities, detailed preparation and application all geared to the single objective of producing the best possible performance time after time after time"

The practice of scenic design and its implementation exists as a major component of a total dramatic experience in a performance space, as it impresses on its audience(s) the idea of location, period, time, season, socio- economic stance of performers, occupation, mood, inter alia. Gillette (2013, p. 163) asserts that "scenery helps the audience understand and enjoy a play by providing a visual reinforcement of the production concept." The scenery created for a drama ranges from an empty stage – what Jerzy Grotowski refers to as an element of his concept of poor theatre (Grotowski, 2002) – to the wildest abstract imagination (which is basically representational); to the realest natural setting simulated on a stage – although Gillette (2013), claims that it is difficult to recreate an entirely accurate historical period or style on stage.

Implementation of scenery is necessary for a complete communication cycle between the director, designer, performer, and audience. Gerald (1989, p. 1) describes scenic design in the light of its

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ability to relay correctly the intent of the playwright and the director as "the art of devising appropriate surroundings for the action […]". In this sense, the designed scenery not only glorifies itself in terms of aesthetics, but also serves as a medium of communication between the designer and the audience, conveying meaning and emotions. Edu (2001), draws on Millerson Gerald's description to broaden its functionality when he defines scenery as "the creation of an appropriate environment of an action; for a play or an event in a theatre within any given space at a particular point in time" (p. 1) The keywords in this definition are 'appropriate environment,' which means that the scenery should be appropriate for the event for which it has been made available.

Although the stage scenery does not make the production, it does contribute to the overall appreciation and understanding of the drama. It is a critical component of the production's visual appearance. Scenic designs for play productions in modern Ghanaian theatres tend to denote acceptance of the above- mentioned definition of scenic design. Scenic designers provide a comprehensive setup that gives the environment a unique atmosphere in an attempt to increase audience appreciation of the play. This arrangement, which could include furniture, shelves, cabinets, wall hangings, draperies, and carpets, among other elements, designates a specific location or adds decoration to a background. The use of these structures for better understanding justifies scenic design. Scenic design does not only apply to the stage; it is also an important component of the film and television industries in terms of mood and atmosphere creation.

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While some designers, and some scholars (for example Sanders, 2018), have considered stage properties to be a component of scenic design, Dufford et al., (2015), have stated otherwise in their description of scenic design in their write- up on *stagecraft*. For them, scenic design

can include any non-costume visual element used in support of a production. It will be defined as any nonpermanent two-dimensional or three-dimensional background or environmental element that is placed on the stage so as to suggest the historical period, locale, and mood of the play being performed. While properties, for example, set props (sofas, chairs, draperies, and so forth) and hand props (any non-costume items handled by the actors, such as glassware, cutlery, or books) do the same, they generally are not considered to be scenery (n.p.).

Their argument implies that some designers and theatregoers have frequently misclassified the ornamentation of the acting space as scenery. Some pedagogues discuss property making or designing as a component of theatre in its own right, where individuals train to gain expertise in props making, in order to clear up this confusion (Crabtree & Beudert, 2012; Dufford et al., 2015; Gillette, 2013; Gillette & Dionne, 2019; Wolf & Block, 2014).

The craft of designing for the stage has generated a lot of names for itself – set design, scenic design, scenery design, stage design, and recently

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becoming a popular concept in critical work of design is scenography. While all these terms are considered synonymous with the same practice, some scholars have clarified that scenography is the mise-en-scene of the production, which encapsulates the costume, light, sound, and scenic design (see for example Aronson, 2005; Burian, 1970; Di Benedetto, 2012; Wilson, 2015). Aronson (2005, p. 7), contends that scenography "implies something more than creating scenery or costumes or lights.

It carries a connotation of an all-encompassing visual-spatial construct as well as the process of change and transformation that is an inherent part of the physical vocabulary of the stage". Still, Laura Grondhal maintains that scenography can be used interchangeably with scenic and lighting design, while in her article which is entitled "From candle light to contemporary lighting systems: How lighting technology shapes scenographic practices", she contextualizes scenography from the viewpoint of lighting design and techniques (Grondahl, 2014). In the light of Grondahl's study, the terms scenic design, set design and stage design have been used synonymously to refer to the same concept of designing an environment for the theatre.

Although this study touches briefly on lighting, costume, and sound because theatre is a collaborative venture, the onus of discussion lies on the scenery designed, for which reason reference is not made to scenic design in the context of scenography as distinguished by Aronson, 2005; Wilson, 2015, and others. These definitions and arguments are extensive and have provided a basis for understanding what scenic design is, however, they still tend to be silent on its activism power particularly in the light of current

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sustainability discourses through which a platform is provided for all fields and disciplines to reconsider certain practices and techniques. Often, scenery for any artistic creation transcends the aesthetics to assume heuristic features by way of underlying clues and hints in form as subtle as the movement of the strokes of the brush paint to the obvious as the employment of the *adinkra* symbols in the context of a scenery designed for a Ghanaian play.

Scenic design does not exist solely for its aesthetic qualities but embeds in it the function of defining the world of the play (such as time, place, socio- economic stance, period, etc.), evoking the mood of the play (atmosphere and feeling), reinforcing the style of the play (realism, abstract, expressionism), support and amplify the dramatic action, and to attract the focus of the audience. By the provision of these hints and clues that support the action, the audience is capacitated to easily understand the presentation on the stage. These elements of communication open a forum for a diversified experience as the entire house analyses the production from different perspectives (Edu, 2001; Gillette, 2013; Gloman & Napoli, 2007; Wolf & Block, 2014).

Considering scenic design from three angles – as an installation art that seeks to draw different understanding and levels of relatability; as a setting created for a theatre performance; and as a tool of communication and education – I will attempt to unify the descriptions of scenic design within a socio-cultural context as: the creation of an appropriate environment to embody the philosophy and aesthetics of a design concept for the purposes of a theatre performance that supports the actions of the

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play and provides or become an appropriate communication medium in the shared experiences between all players of the production.

Designing for the Stage

The world of theatre extends beyond the actors and their actions on stage to include lighting design, scenic design, costume and make-up design, sound design, box office, stage management, directing, property, and stagehands. For a theatre performance to be deemed successful, it should have been subjected to thorough scrutiny and analysis from the director to the designers and actors. This process happens simultaneously with the art of rehearsing the movements and dialogues, which could take weeks, sometimes months. Groves (2010) implies this when he says, "theatre is more than what we see on stage. What is visible once the curtain has been raised is the fruit of much work, consisting of learnt skills, precise activities, detailed preparation and application all geared to the single objective of producing the best possible performance [...]" (p. 13).

The existing extensive history of scenic design, as recorded in the numerous theatre scholarly publications (Brockett et al., 2010; Brockett & Hildy, 2013; Carver, 2009; Collins & Nisbet, 2010; Crabtree & Beudert, 2005; Dufford et al., 2015; Fletcher, 2009; Gillette, 2013; Gillette & Dionne, 2019; Wilson, 2015; Wilson & Goldfarb, 2018; Wolf & Block, 2014), reveals that contemporary three-dimensional scenery is a significant departure from more ancient forms of theatrical scenic expression, which tended to rely on communicating action and mood rather than actual

representation of space. Since its identification as a distinct art form during the Classical period around 500 BCE, theatre scenic design has existed for over two millennia. Stage design, like the practice of theatre itself, has evolved significantly, from the materials used in its construction to creative methodology and spatial characterization.

Although many writings identify the Greek civilization as the birthplace of theatre (for example Altman George et al., 1953; Brockett et al., 2010; Brockett & Hildy, 2013; W. David & Dymkowski, 2013; McConachie Bruce et al., 2016; Underiner et al., 2016), others identify the Egyptian civilization as the true north of the compass of theatre arts (Underiner et al., 2016; Wetmore, 2003). Ancient Egyptian theatre was structured differently than the Western mode of performance we know today, similar to the theatre of the then Gold Coast, now Ghana, which was characterized by festivals, rituals, mimesis, and dance. The functionality of these performances, and their effect in ancient African theatres, was in their processes of social development, ideology formation, knowledge system, and kinship with both fellow men, and the very spiritual space within which they exist.

Du S. Read (1995), argues in the chapter on the *Beginnings of theatre in Africa and the Americas* that the denial of the existence of theatre in Egypt and for that matter African countries is attributed to interpretation and perspective that made

> more complex both by the relative paucity of the
> historical record and by the privileging of literary

reception and values. […] The resort to such terms as ritual drama, ceremonial drama, festival drama, and dance-drama reflect the inadequacy of Western categories in the face of different performance skills and expectations, while notions of the 'primitive' and pre-theatre defer to the dominant Western mode of theatre and distort the particularities of indigenous traditions (p. 93).

Read's perspective implies that drama, performance, scenery, costume, pageantry, all existed within a certain cultural context that the Western definition of theatre could not capture. However, this does not negate the fact that theatre and performance existed in Egypt before the influx of Western theatre. The context for the practice of theatre in ancient Egypt was the festival. These were the times when the gods were paraded from the temples through the city, into the countryside, and back. The journey, as well as events staged along the way, enacted the gods' experiences and took place over a number of days. The particularities of this indigenous tradition registered the natural occurring space as the setting for the performance (Brockett & Hildy, 2013; Du S. Read, 1995; Wilson, 2015).

Similar to the Egyptian context of performance is Ghana's, although numerous festivals are celebrated yearly by virtue of the many ethnic groups that make up the country. For instance, Gbadegbe (2013), records this as the *Asogli* Yam festival of the people of *Asogli* State in the Volta Region. On the grand durbar day which climaxes the week-long celebration, there is

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pomp and pageantry at its highest display as the Paramount Chief and other divisional chiefs process amidst drumming, singing and dancing, to the durbar ground to receive homage from their subjects.

Characteristic of this occasion is the recitation of appellations which tend to place the various chiefs at different levels of traditional function.

> […] There is an interesting display of paraphernalia which includes various stool properties, spokesman's staff, state swords, state drums, specially decorated sandals, state umbrellas and the effigy of the *Hosi* (market goddess) among others. The procession is led by the gong-gong beater, followed by the drummers, horn blowers, spokesmen, state sword bearers, stool carriers and the carriers of various native items including cosmetics and jewelry (pp. 67-68).

The colourful detailed descriptions of the mode and context of performance within at least some African setting, by the two authors above, give a clear indication that the performance of indigenous theatre existed in its pristine form that could not be defined or characterised by the Western definition of theatre. It in fact makes sense to regard the entire festival setup as dramatic. The groove where the rituals are performed, for instance, serves as the background for the performance of the religious exercise. Additionally, these descriptions reiterate the idea that the setting of the performances were not restricted to specially built structures, and against

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simulated backgrounds, but they occurred in the natural environment, at various spots and points in time.

According to David & Dymkowski (2013), when the art of Western dramatic performance was first identified in the city of Athens in Greece in 534 BCE, the stage design was a fixed block, compelled into a coalescence with the platforms meant for acting and other dramatic activities. The immovability of this design implied that all plays were performed against this background regardless of its suitability or otherwise. Since then, scenic design has evolved through the Romans, Italians, English, and Americans, reaching a creative and revolutionary peak during the Renaissance and Baroque periods from the 14th to the 18th centuries. While the list of periodization of the theatre histories is quite extensive (for example in Brockett & Hildy, 2013; Wilson, 2015), a few periods are selected to highlight a comparison of the development of scenery between the theatre of the West, and that of Ghana.

In the Roman theatre, Brockett & Hildy (2013), state that the subtle move of the staging area to a raised platform, and the transformation of the seating area, the *cavea*, into a semi-circle served as the distinguishing features of the Greek theatre house. Like the Greek playhouses, the Roman theatre stage was made of concrete However, the transformation of theatre stage design from the Romans to the Italian Renaissance is described in a manner that is suggestive of pronounced features.

Perspective architecture and scenery painting are said to have begun in Italy when the outdoor performances that classified the Greek and Roman

theatre were relocated into built structures that served as theatres and performance halls. Wilson (2015), and Wilson & Goldfarb (2018), describe the perspective painting and raked or angled stages, as imprinting an illusion of depth and distance in the minds of the audiences during the Italian renaissance. It is noteworthy that the concept of stock sets emerged from this period as pieces of scenery propped at the wings of the stage were reused in different dramas.

Continuing in the line of striking modifications, of the Baroque period of the 17th and 18th centuries were features characterized by exaggeration, heavy ornamentation and complicated designs. The proscenium stage and the horseshoe shape of the auditorium seating, which were developed during the renaissance were during this period well refined in details to create intensity by the use of contrasts. Gillette (2013), says of the baroque period as equally featuring exaggerated costuming and makeup of the performers to complement the buildings and performance structures.

While there was an explosive array of playwriting styles during the English Restoration period, the stage saw minimal inclusion and modification in its design. Plays written expanded to cover such topics under social life, faith, restoration of monarchy, comedy of manners, heroic couplets, politics, etc., yet the sinking of the portion of the stage that extended towards the proscenium arch to create what is called the *apron* was the major modification made under this period. Until such a time in the 19th century when David Belasco reinvented the stage scenery to reflect the description in the context of Western theatre as a mirror of life, scenery maintained its two-dimensionality which was borrowed from perspective

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painting of the Italian renaissance.

David Belasco and his chief assistant George Gros are credited with creating some of the most memorable scenic inventions of the American theatre, as well as some of the finest realistic scenery in the world. They were famous for their ultra-melodramas with room-like box settings and fully dimensional architecture. However, their "realistic memorable scenic achievements usually were for less than memorable plays, and ironically, their work was timed for the eve of the revolution that would displace them" (Crabtree & Beudert, 2005, p. 415). A revolution championed by radical visionaries such as Adolphe Appia and Edward Gordon Craig.

Innes (2004), in his book, *Edward Gordon Craig: A vision of theatre* which seeks to demonstrate the reconstruction of productions from the past through the use of promptbooks, designs, rehearsal notes, stage photographs, etc., credits Edward Gordon Craig as one of the key figures in the development of scenery in modern theatre to whose theatre practice spanned England, Germany, Russia, Italy, and France. It is on this basis that theatre histories (for instance Brockett & Hildy, 2014; Brockett & Hildy, 2008; Fischer, 2014; Gillette & Dionne, 2019) acclaim the 20th century to be a century of revolution.

Crabtree & Beudert (2005, p. 415), assert that precedence was given to the play text for it was believed "that the scenery should only evoke imagery not dictate it, for the betterment of drama." For this reason, no "illusionistic painting was permitted […]" because the "scenery could not conflict or compete with the actor's voice, movement, and presence." This

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new stage was considered a truthful and "a real space for the actor to live in." A resemblance to this style of staging is perhaps the expressionist theatre movement which began in Germany in the 20th century (Styan, 1983; Walker, 2005).

Borrowing from these periods as well as the masterminds, contemporary stage design has been influenced heavily by technology, so much that incredible scene changes can be done a number of times for a single play, with the use of revolving stages, and flies, and cycloramas. And with the help of technology spectacular scenes are created that awe audiences and instill additional levels of understanding of relationships with the performance. Designers of this age have explored digital imaging and xerography, using projected images, photographic collages, and mechanically painted scenic units (Crabtree & Beudert, 2005).

In essence then, until the mid-nineteenth century, consideration was not given to the scenic elements "(period, country, locale, socioeconomic status, and mood) that most contemporary designers believe make up a well-conceived stage setting […]. Only in the past one hundred and thirty (130) years has scenery evolved into its present form" (Gillette, 2013, p. 163). Until the Renaissance, the stage house's facade served as the backdrop for the action. There was no scenery in the traditional sense, despite the use of set pieces and furniture such as thrones. Along with proscenium theatres, actual scenery first appeared in Italy, then France and England (Wilson, 2015). It is therefore indicative that not only was stage and/or scenic design revolutionized, but the very theatres that housed and displayed those designs were equally well engineered to accommodate and provoke weightier

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creativity as Di Mari (2002) Johnson (2018) tell of these developments.

Ghanaian Scenic Design in Perspective

Unlike the aforementioned civilizations' theatrical histories, Ghana's history of stage design in particular, and theatre in general dates only from the 1900s. In a study that details the progression of scenic design in Ghana, beginning with the Concert Party tradition, Adjahoe (2017), claims that scenic design has advanced from a simple backdrop of cloth or canvas, from a two- dimensional representation of townships or settings to a three-dimensional realistic scenery. The use of scenery for performances was minimal during the Concert Party tradition, which lasted from 1960 to the early 1990s.

At the time, the Concert Party was a traveling theatre tradition. Troupes traveled from town to town, putting on shows in market squares, lorry stations, people's compound houses, and so on. They were accompanied by the band that usually performed for them. This implied that the musical instruments would take up space on the bus, followed by the sound systems, properties, and costumes. This left little or no room for elaborate set design.

This tradition primarily employed cloth or canvas backdrops with images of the play's major thematic element. The images were also painted on boards that served as promotional tools. The billboard served as a backdrop for the performance in the absence of the canvas backdrop. Similarly, the usual eight yards cloth draped on the shoulders of Ghanaian

men were draped as backgrounds for the shows. Using backdrops, performers fundamentally demarcated the acting space from the backstage for the Concert shows. When performing at compound houses, the verandahs were masked with cloths to demarcate the acting space and serve as the backstage.

The National Theatre, in collaboration with the Unilever, Ghana, organized a revival series for the Concert Party tradition when it was on the verge of collapsing due to the numerous curfews imposed as a result of the country's coups (Cole, 2001). When the Concert Party relocated to the National Theatre, the scenery changed. For a time, during the early years of the revival, set design was transformed from draped cloths as backdrops to the construction of flats with illustrations of the rudiments of the Concert Party tradition, in addition to some village imageries (Adjahoe, 2017).

Scenic design for the Concert Part revivals evolved into a two-dimensional painting of houses, structures, trees, shrubs, and so on, on flats between 1996 and 1998. The forest trees and shrubs were painted on khaki material and rigged from the flies. This backdrop was consequently flown down in almost, if not all, of the performances. The two-dimensional set designs were placed in front of the forest backdrop. By 1999, three-dimensional representation of setting was gaining traction in the designs for Concert Party shows. Pillars were constructed in order to create a realistic effect. Structures were also painted and built to establish the concept of realism.

While the Concert Party revivals were going on, the National

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Theatre's resident theatre group, the National Theatre Players (Abibigromma), was also putting on shows. Designers such as John Djisenu (who happens to be one of the pioneer teachers of technical theatre at the University of Ghana, Legon) lent their expertise to these performances. Scenic design for National Theatre performances in the early 1990s, like the Concert Party revival series, was modeled after the two-dimensional stage setting that characterized the Italian Renaissance and subsequent periods. Scenic design evolved from two- dimensional to three-dimensional realistic sets, thanks to the contributions of foreign designers such as Anton Philips. Designers used curtains and tormentors to efficiently mount individual structures rather than building a box surrounded by the audience.

Selective naturalism was used in some designs for resident theatre group performances. Scenery design was very minimal at the Ghana Drama Studio between 1961, when it was founded, and 1993, when it was relocated to the School of Performing Arts. It was discovered that some of these performances, like the periods before the Renaissance, did not employ actual scenic design, but used the façade of the structure as the background for the actions. During other performances, a rather simplistic design, made up of plainly painted flats were sparingly placed on the raised platform. Following the Studio's relocation to the University of Ghana campus in 1993, scenery design and construction for performances were again based on two-dimensional representation. For performances at the Efua Theodora Sutherland Studio, scenic design had equally progressed to three-dimensional realistic designs by 1995.

Designers such as Johnson Edu and John Djisenu created scenery

that simulated real houses, sometimes adding natural trees and shrubs. The Diploma students at the time, such as Aaron Yeboah Annan and Philip Sarpong, successfully tried their creative hands on the concept of three-dimensional painting to achieve realism. In all these explorations of an entirely new concept, the use of backdrops was not sidelined when there was a buildup from two- dimensional perspective paintings to three-dimensional scenery.

Contemporary Ghanaian scenic design has been greatly influenced by technology, much like 20th century Western theatre scenery design, which owes its development to technology. There is also the prevalence of the internet, which many designers use to broaden their creative horizons, and with the strengthening of international relations, particularly between tertiary institutions, remarkable designs for Ghanaian theatre performances are being created on a daily basis.

Ghanaian designers have experimented with digital scenery only in the twenty-first century. Scenic Designer/ Director, Johnson Edu, and Scenic Designer, Mawukplorm Adjahoe working closely with the Director, Belinda Bediako on experimenting with the directing technique of *bricoleur*, have employed projection in aspects of their design works for the performances of the children's play *The Adventures of Sasa and Esi* by Matin Owusu (performed at the University of Cape Coast and the University of Education, Winneba in 2018), and Bill Marshall's *Asana* (performed at the University of Ghana in 2015), respectively.

It took the courage and confidence of Visual Artist/ Scenic Designer/

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Director Ossei Agyemang to create a full-fledge virtual world for the performance of the stage adaptation of Ayi Kwei Armah's novels, *The Beautyful Ones are not yet Born* and *Osiris Rising*.

While this adds to the track of the development of scenery for performances in Ghana, the question arises as to its sustainability in the face of erratic electricity power supply in Ghana amidst talks of investing in clean or renewable energy supply such as wind and solar, as stated by the United Nations (UN) in the Sustainable Development goals. This brings the discussion to touch on concerns of how sustainable the practice of scenic design is in Ghana, and how it contributes to the discourse on the Sustainable Development Goals.

Staging for sustainability

In the foreword to the book *Introduction to Sustainable Development* (Rogers et. al., 2008), Bindu N. Lohani documents that the United Nations Environment Programme Secretariat was formed as a result of the UN Conference on the Human Environment in Stockholm, Sweden in 1972, to promote international environmental cooperation. The World Commission on Environment and Development, chaired by then-Norwegian Prime Minister Gro Harlem Brundtland, issued a report titled Our Common Future in 1987. Since then, for more than three decades, aided by the 1972 UN Conference on the Human Environment in Stockholm, the concept of sustainable development has been evolving to emphasize the importance of environmental protection as a key component of the development agenda.

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This seminal document, also known as the Brundtland Report, contends that establishing separate environmental institutions is insufficient because environmental concerns are inherent in all development policies. They are critical to economic considerations and sector policies, and they should be considered in energy decisions, social issues, and other aspects of development work. In 1992, the UN Conference of Environment and Development in Rio de Janeiro, also known as the Earth Summit contributed to the evolution of sustainable development discourse by endorsing Agenda 21, which was a program of action governing human activities with an impact on the environment. It also endorsed the Rio Declaration on Environment and Development, and the Statement of Forest Principles (Hawkes, 2001; Kagan, 2019; Rogers et al., 2008).

The Sustainable Development Goals (SDGs) were adopted by the UN 193 member states on September 25, 2015, and went into effect on January 1, 2016. These goals build on the previous Millennium Development Goals (MDGs) as a normative and technical framework for coordinated government action toward global development. Duxbury et al. (2017), talk about the important shift from 'development' as in the Millennium Development Goals to 'sustainable development' as a move that "signals both a shift in objectives (towards sustainability) and a shift in scope (from 'developing' countries to all countries)" (p. 214). With all countries now involved in achieving sustainable development, it falls to each individual to reconsider activities that may be viewed as an impediment to the pursuit of sustainable development.

The UN Sustainable Development Goals, which comprise

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seventeen (17) goals and one hundred and sixty-nine (169) targets, aim to improve the lives of current and future generations within the frameworks of equity, inclusion, and sustainability. By identifying a set of priorities and establishing time-bound and measurable objectives, the goals and targets aim to establish specific political agendas and increase global awareness of socio-economic and environmental issues. The goals and targets aim to establish specific political agendas and raise global awareness of socioeconomic and environmental issues by identifying a set of priorities and establishing time- bound and measurable objectives (Andreoni & Miola, 2016; Brundtland, 1987; Kagan, 2011).

Because of the diversity of ethnic groups in Ghana, as well as the attendant diversity of cultural expressions, arts in Ghana have served as a touristic tool, generating billions of Cedis each year. The International Trade Administration, and *statista*, reports that Ghana's Tourism, Arts and Culture sector remains a significant contributor to Ghana's GDP making some $1.9 billion in 2020 and $2.1 billion in 2021 respectively. This reflects an increase of $200,000,000 even at the height of the coronavirus pandemic with travel restrictions and business disruptions. The Ministry of Tourism, Arts and Culture (MoTAC) projects some $2.3 billion in revenue for the sector this year (*International Trade Administration*, 2022; Sasu, 2022a, 2022b).

Ideally, this gain should affect the long chain of the 17 SDGs as they are all interconnected, however, it is not entirely so. The World Tourism Organization (WTO), which operates under the auspices of the UN, has stated that "tourism has the potential to contribute, directly or indirectly, to

all of the goals. In particular, it has been included as targets in Goals 8, 12 and 14 on inclusive and sustainable economic growth, sustainable consumption and production (SCP) and the sustainable use of oceans and marine resources, respectively" (World Tourism Organization, n.d.).

The SDG 8 addresses decent work and economic growth, and the target 9 focuses on devising and implementing "policies to promote sustainable tourism that creates jobs and promotes local culture and products". The statistical report of *Statista* reflecting the contribution of travel and tourism to Ghana's employment from 2005 to 2020 reveals a fluctuation in the years under review with three key highs in 2006 (at 8.73%), 2012 (at 7.35%), and 2019 (6.0%). The result reveals a consistent decline even in the peak years with the lowest recording of 4.2% for the year 2020, possibly attributive to the coronavirus pandemic.

It has been discussed in the previous chapter on the National Theatre of Ghana's engagement with other stakeholders in the sector. The 'state-of-the-art' edifice houses three resident performance groups – the National Theatre Players, Ghana Dance Ensemble, and the Ghana Symphony Orchestra. The Patronage of these three performance organizations, however, is lower when compared to the patronage of private theatrical companies that utilize the National Theatre as their event site.

In her analyses of the concept of audience development in an attempt to create an audience development plan for the National Theatre of Ghana, Frimpong (2015), concludes that the management of the National Theatre failed to establish a deeper relationship with the Concert Party audiences

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that filled the auditorium from 1994 to 2001. This was because management by then was not interested in audience development. Secondly, the fact that the resident performance groups are autonomous and only answerable to the Executive Director places a financial burden on these groups' coffers. This is because they have had to finance their own productions.

Government neglect of the theatre and arts industries in terms of funding, as well as budget cuts, did not allow for audience development. The significant expense of maintaining the massive structure had an impact on the cost of renting the space for shows. Putting on a show at the National Theatre auditorium became a prerogative of the bourgeoisie, with expensive ticketing. As a result, many began to question the vitality and purpose of the National Theatre as a pivot in the development of Ghana's arts industry.

It was as a way of revitalising the arts and theatre and their essence in Ghana that the management of The National Theatre of Ghana, under the executive directorship of Madam Amy Frimpong, entered into an agreement with theatre production houses to rent the performance space at an affordable price. Such a move has indirectly led to the creation of jobs through entrepreneurship, which has in turn contributed to the increase in the number of privately owned theatre production companies.

Even with this gesture as a method of contributing to SDG 8, many artists, particularly those in dance ensembles, eventually emigrate to other countries, mainly Europe, in pursuit of 'a better life'. The findings of Jason Otoo's, 2020 research on dance troupes in Cape Coast, reveal this conflicting relationship between the development of the sector, and the

decline in employment. He discussed members motivation to join a dance ensemble as ranging from sheer interest in "dancing and drumming, to just being interested in it because of the personal gains they got from it" (p. 102).

By 'personal gains' a number of the respondents in his study attested to the opportunity that belonging to a dance ensemble presents as a means to travel abroad. Meanwhile, a previous study by Samuel Anlimah in 2018 identified some challenges that dance troupes face, including but not limited to "the lack of rehearsal space and facilities, the use of illicit drugs, and the non-lucrative nature of the venture" (as cited in Otoo, 2020, p. 100). However, his research indicates that the dance troupes did not regard these problems as the main factor that drove them out of the nation, but rather the desire to marry and live in Europe was the motivating force.

From the analysis, while the income from the performances helps to alleviate personal financial concerns, the ultimate goal was to travel overseas and live a 'good life.' This may be interpreted as one of two things: a disclosure of deeper structural failure in the Ghanaian economy for artists, or simply a personal decision. Nonetheless, the 2021 Ghana population and housing census indicates that, some 51,100 men and 36,200 women were employed in the arts, entertainment, and recreation domain (Annim et al., 2021).

Again, this collaboration by the National Theatre, among other strategies put in place by the MoTAC, and its subsidiaries to create a vibrant cultural sector, can be seen as contributing to SDG target 'b' of goal 12 as

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outlined by the UN. The target states to "Develop and implement tools to monitor sustainable development impacts for sustainable tourism which creates jobs, promotes local culture and products". The World Trade Organization (WTO) has launched a 10-year Framework of Programmes on Sustainable Consumption and Production Patterns (10YFP), which aims to develop such Sustainable Consumption and Production practices, including resource-efficient initiatives that result in improved economic, social, and environmental outcomes.

Enjoined by the 1982 Provisional National Defense Council (PNDC) law 238, the Centres for National Culture across 10 regions of Ghana were established under the direction of the National Commission on Culture, then referred to as the Arts Council of Ghana. These cultural centers participate in programs and activities that aim to create, conserve, and promote Ghanaian arts and culture (Amaniampong et al., 2017; DeBerry-Spence, 2010; Fiagbedzi & Fio, 2022; Flolu, 2000).

What happens at these Cultural Centres that aligns with the precepts of the WTO, is that they most often serve as domestic tourism for the locals through activities such as play productions, inter-school drama festivals, arts workshops, and exhibitions, among others. During major arts and culture festivals such as the Pan-African Festival (Panafest), and recently 'Year of Return' (which was celebrated in 2019 to mark the 400th year of the first entry of the first slave to Virginia), and 'Beyond the Return' (10-year project to consolidate the gains of the Year of Return and grow tourism in the country, showcase its investment potentials and solidify its diaspora engagement programs to promote the African Renaissance), as well as the

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indigenous cultural festivals of the various communities, tourism expands to become international.

One Centre that has gained fame as the most vibrant of all the Centres is the Centre for National Culture in Accra. In addition to basic performance auditorium and offices, this Centre has been resourced with an enormous space where artisans showcase their rich skills through different craft works depicting Cultures and personalities. On display for sale are the major regional Kente (a woven cloth regarded as a royal regalia) – variations in Ewe, Ashanti, Ga, and Northern Kente), sculptures of all kinds, drums, beaded accessories, jewelry, among many others. It is the presence of this art and craft village that has earned this Centre the famous name, Accra Arts Centre.

The development of an organised space for these creative artists was an initiative championed by the then Director of the Centre, Mr. Alex Sefah. His aim for the initiative was to promote the development of the arts and crafts markets. He says in a newspaper report that the development of the markets at the various Centres for National Culture into arts and crafts villages "will attract art works and many other artifacts to be displayed in a neat and decent environment to boost sales" (Numekevor, 2006). He stressed the importance of time and space as major resources for the artists for which the provision of the crafts village will enable the creation of employment opportunities to alleviate the unemployment plight of the youth.

While the SDG goals may be viewed as distinct entities, they are inextricably linked in such a way that it is impossible to pursue one

while abandoning another. In effect, any plan to work towards achieving a specific goal of a specific aspect should have taken into account the effects that the process will have on the remaining aspects of the SDGs. In this context, the SDGs' complex framework aims to address a diverse set of interrelated goals. However, synergies and trade-offs can arise, and policies designed to address a specific problem may have consequences for other areas of sustainability. Dörg et al. (2018, p. 1), opine that "in today's dynamically evolving global environment effective policymaking requires an understanding of the interdependency between the sustainable development goals and an in-depth interpretation of cause-and-effect relationships that connect them."

In proposing a specialised modelling tool that could improve the analysis of the integrated policy-making and implementation by examining synergies and possible strategies for tackling trade-offs, Dörgo et al. (2018), emphasize the shortcoming in the examination of the UN sustainability datasets and their severe insufficiency. They highlighted the importance of the national interlinkages, or the nexus of interlinkages, between the goals and targets.

Similarly, Andreoni & Miola (2016), analyse some of the possible interactions between the concept of sustainable competitiveness and the SDGs in their report for the European Union on the *Competitiveness and Sustainable Development Goals*. They also recognize the inclusion of stakeholders with diverse interests and views, as well as the understanding of potential linkages between the many sustainability dimensions, as critical components for achieving the SDGs. Coordination across multiple levels of

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management, as well as the participation of public and private initiatives, are also essential to make the SDGs a global agenda based on a shared responsibility approach.

The core of their concern is the need for sustainability players to deeply ponder and analyse the converging and diverging points in embarking on sustainability projects, and to find means of addressing trade-offs. This proposition implies a holistic approach to discussing and embarking on projects intended to achieve the UN's Sustainable Development Goals.

In identifying the trade-offs within the context of the Accra Arts Centre for example, while the availability of facilities for creative exhibition adds to the flood of artisans and artists at the Centre for National Culture in Accra and beyond, the manner of developing local culture for mass consumption and tourists remains largely unsustainable. Lumber and logs which are derived from the forest reserves are used extensively in the construction of sculptures, such as the Akuaba dolls, masks and other souvenirs, as well as drums. This invariably contributes to the deforestation problem in Ghana despite governments' efforts towards afforestation projects.

In March 2021, the Government of Ghana through the Ministry of Lands and Natural Resources (MLNR), launched the Green Ghana project, an initiative which is aligned with the Ghana Forest Plantation Strategy (2016 – 2040) (IUCN, 2021). The project's aim lies in an aggressive national afforestation /reforestation programme to restore the lost forest

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cover of Ghana and to contribute to the global effort to mitigate climate change.

In the maiden edition, an estimated 7 million trees were planted across the country. The MLNR came up with two strategies. The first was planting in degraded forest reserve compartments across the country, an estimated 10 million tree seedlings; and the second was planting to be done outside forest reserves, within farms, along watershed areas, in road medians, the compound of homes, schools, churches, offices, etc., Within recreational grounds or parks (*Rejuvenate Our Land*, n.d.). The major tree used for this project was the teak. The choice of trees rather suggests an economic alignment of the reforestation project.

Although the government's attempts to restore forest cover are commendable, the tree-felling to reforestation ratio is cause for concern. The Global Forest Watch reports that from 2001 to 2021, Ghana lost 1.41 million hectors of tree cover, equivalent to a 20% decrease in tree cover since 2000, and 740 metric tons of CO_2 emissions (*GFW*, n.d.). Secondly, Enters (2000), Nair & Souvannavong (2000), and Roshetko et al. (2013), have asserted that teak takes a minimum of 20 to 25 years to reach maturity for harvesting. Third, the reliance on teak for reforestation results in a lack of diversity in the forest cover, which invariably affects the total carbon footprint of the forest cover. This is because some trees are said to have a higher carbon footprint than others (Gunderson & Wullschleger, 1994; Karnosky, 2003).

With respect to arts, culture and tourism in Ghana, this jeopardizes

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the WTO's ecological dimension aim. This suggests, thus, that artisans and artists should consider using environmentally friendly materials for the creation process, especially if it is for domestic and international tourism purposes. Then a balance would be established between the economic, social, cultural, and environmental components of sustainability. However, in the current state of affairs, capitalist ideals have taken precedence over environmental concerns while utilizing natural resources for commercial benefit.

In the field of theatre performance, wood is frequently mentioned in the works of famous Ghanaian designers such as Johnson Edu, John Djisenu, Joojo Quantson, and Prince Hilton as a primary source of material in developing their designs for theatre or other areas of the performing arts. Johnson Edu, the erstwhile Technical Director for the National Theatre of Ghana and the scenic designer for the then Concert Party performances, has constructed majority of his designs using wood as the main material.

Aside the many scenic design projects for the Concert Party, some of his works include *Mother's Tears* in 1994 at the Commonwealth Hall, Legon; *A Midsummer Night's Dream* in 1997 at the National Theatre; *Firestorm* in 1999 at the Efua Theodora Sutherland Studio; *The Adventures of Sasa and Esi* in 2018 at the University of Cape Coast and University of Education, Winneba, among many others.

Similarly, John Djisenu, who is recognized as being the first Ghanaian teacher of technical theatre at the University of Ghana, has a number of designs to his name, all of which use wood as a primary building

element. His status as a teacher of art indicated that his students were educated in the same pedagogical foundations of scenic design. Some of Djisenu's works are outlined as *The Witch of Mopti* in 1998 at the Efua Theodora Sutherland Studio; *The Trial of Dedan Kimathi* in 1993 at the National Theatre; *Old Story Time* in 1994; and others.

Being an adopted concept, this situation is not peculiar to Ghana. Professional set designers, theatre practitioners, and theatre scholars from across the globe share similar experiences in their scholarly writings and project reports. Millerson (1989), Gillette (2013), Gloman (2007), Parker (2019), Block (2014), Wolf (2014), just to name a few, provide in-depth discussions among other things, on the essence, process, and styles of stage designing while referencing spectacular designs that appear to have wood among their chief materials.

Consequently, Michael J. Gillette who has authored eight editions of *Theatrical Design and Production*, and seven editions of *Designing with Light* have discussed in detail, the materials, tools, and processes of designing for the stage with reference indubitably made to metal and plastics, but these are subsidiary materials that require special skill training for their application.

Writers have discussed the basic building blocks of a stage design as an element known as the *flat*, with some consideration sometimes for *platforms*, *drops* and *backings*. According to (Gillette, 2013, p. 66) a flat is a "framework, normally made of wood or metal; frequently covered with fabric or thin plywood, although a variety of other covering materials may

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be used. This flat is the major makeup of the stage set up upon which a designer has the space to display their creative prowess in terms of simulating the human environment and representing what is the thought of the director, the playwright and the designer.

The choice of wood and the rubric for the flats is dependent on the concept of cost and availability. In Ghanaian theatre performances, the plywood is the readily available and less costly material that most institutions depend on for design works. Wolf & Block (2014), affirm that "lumber is one of two principal structural materials used in the theatre (the other is metal […]). Because of the wide variation in the availability and the cost of lumber, shops use the best quality lumber that is most convenient and affordable at the time" (p. 117).

In well-funded theatre productions designers explore lofty ideas that require lofty materials and craftsmanship. Prince Hilton, in addition to the wood, has for most of his designs inculcated metal, alucobond (which is an aluminum plate), polystyrene, and foam. In a telephone conversation, he says that "these materials, the polysterene and foam, are durable especially if you want to create a three-dimensional effect. The alucobond is very strong and can be used for many design works, especially if you have the money".

This only highlights the reason for the reliance on the plywood and other lumber for scenic constructions, particularly by academic institutions, which is because of the limited funding available for theatre productions. In another light, although some designers are beginning to experiment with other materials other than the wood, the sustainability of these materials is

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still questioned. Sustainability in terms of the lifespan of the design, what happens after it has served its purpose and its cost-effectiveness. In other jurisdictions, designers have taken the concept of sustainability in creation a step higher by falling on waste materials as resources for the crafts.

Sustaining the Creativity, Creation, and the Created

It is no new thing that designers have applied to their creations, waste materials or items which have otherwise completed the function and utility purpose for which they were produced. During the discussion in their fully illustrated books on textiles and fashion within the light of the burgeoning theory of circular economy (a theory to be discussed later in this chapter), Gwilt & Rissanen (2012), and Pandit, Ahmed, Singha, & Shrivastava (2020), confirm that in recent years the fashion industry has seen an upsurge in creative processes emanating from recycling waste in fashion and textiles. In this sense, some used garments and fabrics, as well as plastics are sourced for the creation of freshly designed solutions.

Abigail Beall discusses in her BBC feature on the textile industry and recycling that, "globally just 12% of the material used for clothing ends up being recycled." She attributes this poor recycling rate to the kinds of cloth we wear saying that "the fabrics we drape over our bodies are complex combinations of fibres, fixtures and accessories. They are made from problematic blends of natural yarns, man-made filaments, plastics and metals" (Beall, 2020).

The result of this complexity is the difficulty it poses in getting them

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separated so that they can be effectively recycled. Sorting textiles into different fibres and material types by hand is also labour intensive, slow and requires a skilled workforce. It is for these reasons that "indeed, most of the recycled polyester being used now by leading fashion brands in fact comes from bottles rather than old clothing" (Beall, 2020).

A number of fashion companies and individuals are gradually migrating from fast fashion to sustainable fashion. For instance, DGrade, a textile company based in Dubai, was founded in 2010 with the goal of providing clients with high-quality apparel and accessories created in a sustainable manner, utilizing discarded plastic bottles gathered as raw material to enable customers to participate in a circular economy.

Their mission is to prevent plastic pollution while also providing sustainable manufacturing alternatives for daily products including apparel, uniforms, bags, and accessories. As a result, the company (DGrade) has created *greenspun*, a high-quality yarn made of recycled plastic water bottles. This greenspun yarn is used in place of typical polyester yarn to make a variety of textiles for clothes and accessories. DGrade takes pride in being the only firm that manages the whole supply chain, from plastic bottle collecting to clothes creation (see DGrade, n.d.).

Located in the heart of Cape Coast, Ghana is the Baobab Children Foundation, a non-governmental organization (NGO) founded by Edith de Vos in 2001 and in the same year, the German organization was registered in Freiburg. The goal was to gather resources to carry out efforts to protect children's rights in Ghana, as well as to meet the educational requirements

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of children in Cape Coast and its surrounding areas (see Baobab Children Foundation, n.d.). Although this NGO is not strictly into the textile and fashion industry, it produces some accessories in the form of bags and purses from recycled plastic water sachets. These accessories are made by the students of the Baobab School for Trades and Traditional Arts, and sold at the Baobab House in Cape Coast.

In the arena of fine arts, many sculptors, and visual artists have turned to eco-art activism to communicate the effects of the unsustainable practices that account for the devastating effects the earth is encountering, while calling for the change in lifestyle and production processes as a way to support and promote a healthier earth. The Australian artist, Barefooted Welder, who also goes by the name Micky D, has since 2015 collected over seven tonnes of scrap metal (steel, copper, and aluminum) for his sculpturing works.

This artist wanders barefoot through dumps, hoping bins, and pausing by secret natural sites. For him, scrap metal inspires his freestyle work, as the repurposed materials force him to think beyond the box. He says that "walking in the open landfills, collecting trash treasures and sorting them, allows ideas to evolve within an ocean full of possibilities. The end is to create something that you haven't seen before" (see Barefooted Welder, n.d.).

In Ghana, Serge Attukwei Clottey addresses the waste menace plaguing the country, through the multidisciplinary approach of performance, installation, photography, and sculpture. Clottey integrates his

dynamic multidisciplinary production around a single motif: the yellow gallon container, a common fixture in Ghana, often referred to as the 'Kuffuor gallons'. Clottey's work resides at the crossroads of creation and action, relying significantly on the artist's immediate and ever-changing surroundings (see Serge Attukwei Clottey, n.d.-a; Serge Attukwei Clottey, n.d.-b).

Clottey has melted, drilled, stitched, and reused plastic gallons in his works of sculpture, photography, installation, and performance by combining them with other materials like as jute sacks and old tires for his assemblages and collages. He has transformed them into props and set pieces in his performances. Clottey refers to his approach as *Afrogallonism*, coined after his preferred material, which has a special tie to trade and water delivery in Ghana.

As part of the year's World Art Day observance in 2022, on April 15 – Leonardo da Vinci's birthday – Ghanaian-based Tapioca Foundation and Imposters Art Collective launched a campaign to educate the public about environmental sustainability. The initiative, which was launched in Ada in the Greater Accra Region, aims to raise awareness in local communities by using art pieces to highlight environmental preservation and climate action problems.

In an interview with CitiNews, Ian Kwakye, the artist and mastermind behind the project, stated that Tapioca is still available to any artist in Ghana and Africa who wish to work in their space, the "Henokami We – the hope hub" at Fort Kongestein, Ada Foah. Fort Kongestein, now in

ruins, was a Danish trading fort that was built in 1783. Despite the location of the paintings' tragic history as a slave-trading centre, Tapioca views it as an opportunity to reframe the narrative in order to inspire the next generation with optimism. Their graffiti pieces highlight global themes such as environmental degradation, global warming, wildlife protection, climate change, and others (see L. K. Sekyi, 2022).

Some designs in the theatre industry have hinted towards eco-friendly stage setups. The rapidly spreading concept of *green theatre* is the result of numerous designers reconsidering the environmental impact of the production process. Heinlein (2006, pp. 16, 17), writes:

> Earlier eco-philosophical treatments do share an underlying tenet with contemporary Greens, notably the cause and effect relationship between humanity's behavior and ecological degradation, and the notion that we must find a course of action to stop, focus, and re- direct our socio-environmental behavior. […] by unifying notions of human behavior into the natural equation, contemporary Greens are aiming toward the discovery of methods for ecological betterment, primarily through devices that encourage changes in socio-environmental behavior. On the most foundational level, by sustaining nature, we are sustaining ourselves.

This statement he made in discussing what makes a theatre a green

venture is suggestive that at a point, theatre practitioners lost cognisance of the bond between humans and nature. Although he makes no clear periodization of the practice of green theatre in history, and a detailed description of the tenets of green theatre, it is deduced that the practice at a point severed its philosophical roots by embracing a primary element of an ideology which separates humanity and nature.

This concept of practicing green widens the conversation on the potential social, economic, cultural, and environmental dimensions that come into play within the field of theatre. In September 2008, the Mayor of London, Boris Johnson, launched a publication full of practical advice dedicated to the theatre industry. The Green Theatre Plan illustrates how London's theatres may decrease carbon emissions by 60% by 2025 (B. Johnson, 2008).

Indeed, the strategy outlined in the document entitled *Green theatre – taking action on climate change*, is not only for the London theatre, but for anybody across the globe involved in the theatre sector, from small independent production firms and arts venues to large commercial theatrical groups. This plan is to enlighten practitioners through some of the most practical and efficient strategies to cut energy use and make theatres more environmentally friendly – all the while saving them money. An important strategy in the area of scenic design outlined in the publication is for theatres and production companies to recycle or sell their old scenery and props, and reduce their waste management costs at the same time.

Tanja Beer (2021), is one designer who models her concepts against

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this green theatre campaign. She hosts an online platform for theatre performers who are interested in or want to contribute to the advancement of green theatre. The site includes information that looks at how to apply an ecological perspective to the performing arts, both in academia and in practice. She refers to her approach to green theatre as *ecoscenography* – an ecological design for performance, for which she has also published a book titled as her concept.

Her blog captures advancements in not just stage design but also costume, lighting design, and sound, and they transcend traditional theatrical traditions. The Australian performance designer, Imogen Ross, whose artistic creations are hosted on the platform, attempts to address the waste issues caused by her set by upcycling and reusing her costumes and set. Ross says in an interview on the site

> "I was always concerned about where the set would go at the end of the show. Living in a rural area meant that we all knew exactly what 'landfill' meant: the whole set was either going to be driven to the local tip on a Sunday morning or it was going to be stored in someone's shed until it could be re-used. The emphasis was always on re- use and upcycling because it felt like we were pouring our hard-earned money into the dirt when we took things to the tip" (Beer, 2021b).

She coated the inside structures of the wombat with 'Who Gives a

Crap' toilet paper covers in her concept for Diary of a Wombat. "A remarkable recycling of something already recycled in its construction", she says. She created an eight-metre-long 'Earth Quilt' out of nearly completely second-hand textiles to portray a cross-section of the terrain as it descends to a wombat burrow for this show. Fabric leftovers were used as filling, resulting in minimal waste.

In her book however, Beer reviews and identifies the loophole in the practice of the concept of green theatre as theatre practitioners mounting productions to superficially suggest its inspiration from nature. She discusses the concept in a manner that the theatre industry has indeed missed the full comprehension of what greening the practice should be. Her concept of ecoscenography then becomes an expansion of the green theatre, clearly defining what constitutes its practice.

Beer (2021a), traces the sustainability movement for theatre production to Larry K. Fried and Teresa J. May's 1992 publication of *Greening up our houses: A guidebook to an ecologically sensitive theatre organization*. Beer acknowledges the considerable academic interest that the move generated in trying to jolt the industry out of environmental complacency. Beer however, providing a period of the failure in green theatre in the 1990s says it failed largely because the theatre industry has been far too preoccupied with its own battles to merely survive economically, to even contemplate its environmental sustainability.

She admitted that the field in recent years has evolved from one in which sustainability has been behind the scenes, to one in which the stage has

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become a platform to engage theatre audiences with ecological issues. Many artists are increasingly calling for the need for theatre to promote sustainability in its full sense, enabling individuals and organizations so that it is not simply about reducing carbon emissions (as declared in the Green Theatre Plan), "but more about efficient and effective allocation of resources, meaningful interactions with communities, ideas and aspiration, and social justice" (Beer, 2021, p. 12).

Her concept of ecoscenography is drawn from these discussions and illuminations, and thus, she describes it as a design inspired by ideas of ecological performance and is not to be confused with the superficiality of nature-inspired set decoration or the use of the natural environment as a scenic backdrop. She argues thus:

> My premise in bringing an ecological approach to scenography – what I propose as 'Ecoscenography' – is to shift performance design to an increased awareness of broader ecologies and global issues: to conceptualise ways in which an ecological ethic can be contemporary reconsiderations of performance design, where creative and environmentally conscious processes align to become a fundamental part of the scenographer's ideas, practices and aesthetics. […]. Ecoscenography calls for a new approach to theatre productions that over turns traditional production models (p. 18)

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Drawing from her concluding statement, I will now argue for the need for designers to consider particularly the material sourcing and process in creating scenery for performances, using majorly waste materials. This concept I have termed as *waste designing*. Maintaining one style over an extended period of time is challenging, especially in the face of shifting trends. As a result, stage designers have occasionally had to experiment with various waste materials, particularly when the originally intended material did not support the design framework, or to achieve a desired design concept, or simply to save money. There have been other instances when stage designers used certain waste materials for some aspects of their designs.

Agnes Adomako-Mensah, for instance, explored the natural environment as an alternative theatrical site, using found objects (in nature, and recyclable) for the construction of the set for the remake of Mohammed Abdallah's *The Slaves*, at the Legon Botanical Garden, University of Ghana. She classified her found materials as natural or recyclable, which will demand little or no alteration for scenic design purposes. Natural materials included branches, bamboo, creeping plants, tree barks, and dried leaves, whilst recyclable (man- made) elements included old newsprints, worn- out posters, water bottles, cement paper bags, and jute sacks. These artifacts were altered for practical use by taping, gluing, painting, and assembling to enhance volume, improve texture, and distort appearance (see Adomako-Mensah, 2016).

As the designer for the performance of August Wilson's *The Piano*

Lesson in 2019, at the University of Cape Coast, I used polystyrene, recycled from an old fridge box, to create a wine shelf. The initial idea was to build one from the wood acquired for the construction. However, when I ran out of the material as well as funds to acquire more wood for that portion of the set, I resorted to an alternative material that cost less or nothing and would save time.

While this empirical evidence presented may be considered as having some essence of sustainability and being ecologically friendly, waste designing calls for a conscious effort to either complement the designs with waste materials of any sort, or to rely heavily on waste products as the main resource for construction. The core of the argument in these examples remains that wood has for many years and counting maintained its position as the premier consult of material for theatre stage designers. This would not have been much of a problem in today's dispensation, had it not been for the overburdened reliance and abuse of our natural resources coupled with the contamination of the environment with multitude a of non-degradable waste.

For this purpose, the proper definition of waste design rides on the call for sustainability initiatives in theatre productions to advocate and support ecological change while balancing a focus on an economic exercise and a potential for cultural and social change. Culture in this context refers to both the specific concept of design practice in theatre and the broad concept of culture as a way of life (Hawkes, 2001).

Drawing on the Tanja Beer perspective (Beer, 2021a, 2021b) then,

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for a design to qualify as waste design, the designer should be fully aware of their environment, understand the implications of their and others' actions on the environment, be positively responsive to environmental issues, and to proceed to take sustainable actions in the mode and processes of production. It is for this reason that nonchalantly including waste materials in design projects without premeditating the actions before and after the production, does not characterise designing in waste.

Holding on to past paradigms has resulted in sustainable design being primarily viewed as one of the limiting or confining existing artistic expression. "Sustainable development" is the fundamental idea of the landmark World Commission on Environment and Development study of 1987, popularly known as the "Brundtland Report" after WCED chair Gro Harlem Brundtland (former prime minister of Norway), which argues for a comprehensive approach to human endeavors. As a consequence, not only have studies in environmental and social fields begun to dovetail, but the study of environmental economics has emerged with a clearer definition. In like manner, environmental law, environmental journalism, and other related disciplines have developed (Allen, 2019).

If the crux of the sustainability talks is the Brundtland definition, which is perhaps the most widespread understanding of sustainable development – "meeting the needs of the present without compromising the ability of future generations to meet their own needs", then should not environmental concerns also encompass social concerns and vice versa? Similarly, should not social concerns encompass economic concerns and otherwise? And should not economic concerns encompass cultural

concerns? The unbroken cycle of the sustainability of human actions should always be considered in these directions to have a holistic approach to sustainability ends.

Creating Sustainability through Theories

Although this research is classified as an art-based or a practice-led research, there was the need to apply some theories, particularly to help in situating the entire discussion within a specific framework. To begin with, the sustainability theory served as a broad umbrella under which all other theories existent in this study fall. The sub-theories are further classified under two topics – environmental sustainability and cultural sustainability. The theories of circular economy and biomimicry are further discussed as proponents of the topic on environmental sustainability.

From the time of the Brundtland report of the World Commission on Environment and Development in 1987, the coalescence of the concept of sustainability and sustainable development was visibly debated, until recently, on levels of social, economic, and environmental discourses (Dessein, Soini, et al., 2015; Hawkes, 2001; Kagan, 2011, 2019; Kirchberg & Kagan, 2013; Soini & Dessein, 2016). In the referred report, sustainable development connotes "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987).

While an ephemeral application of the theory by many institutions limits it to the longevity of a particular project, and what poor nations must

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do to become richer (Brundtland, 1987; Kagan, 2008), recent strand of literature denotes a much deeper reflection of the term to suggest the reconciliation of social justice, ecological integrity, and the well-being of all life systems in the world. Kagan (2011, p. 9), proceeds in his discourse on sustainable development and sustainability on the back of Janet Moore's understanding of the concepts that "the goal is to create an ecologically and socially just world within the means of nature without compromising future generations. Sustainability also refers to the process or strategy of moving toward a sustainable future"

In the book, Kagan (2011) advocates for sustainability by connecting it to the formation of a complex, 'systemic' perspective on reality, to mean envisioning humanity's future in terms of its balanced progression, linking social and ecological challenges, rather than a linear growth track with the economy as its primary focus. The call in the recent progression of scholarship on the discourse of sustainability focuses on challenging and questioning the synonymity of sustainable development to mean continued economic growth (see for instance, Duxbury et al., 2017; Gwilt & Rissanen, 2012; Hawkes, 2001; Kirchberg & Kagan, 2013).

Again, the terms sustainable development and sustainability were established across a pre-existing split of the environmentalist movement in two different discourses – the preservationist and the conservationist discourses. The preservationists sought to preserve natural regions in what was thought to be pristine shape whereas the conservationists heralded the protection of natural areas as a kind of rational self-interest where resources

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can be altered (Kagan, 2011; Robinson, 2004).

Hitherto this research sees sustainability not in the light of preserving nor conserving but considers the concept as a forum for forwarding a discourse on transformation for holistic growth. Transformation herein is discussed to establish a redefinition of the culture of creation, of maintenance, and of conservation – conservation in the sense of optimizing skills to make relevant resources (natural or otherwise) to benefit, not at the expense of, future generations. Thus, sustainability is explored in this context as an umbrella theory that encompasses both conceptions of sustainability and unsustainability (Kagan, 2011) in the pursuit of a fair world.

Kagan & Kirchberg (2016), are of the view that this theory of sustainability calls for the pursuit of 'modernism' in the sense of development where reconsideration is made of the cultures of unsustainability, particularly of hyper-consumption, and hyper-production. They contend that the transition to a sustainable culture includes various ethical and normative components saying

> a fundamental shift in contemporary culture away
> from a hyper-consumption oriented, hyper-
> industrialised, hyper- modern culture and towards a
> culture infused with an understanding of and a respect
> for life in all its complexity; a culture empowering
> people to change their lives in order to re- invent
> another, more sustainable "good life" that is inclusive

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of human groups until now oppressed or disadvantaged (p. 1490).

Yet this classical modernity sees objects and people as separate from each other and their environments so that for instance, in the name of economic development, the environment suffers greatly. Kagan argues for a more systems-oriented approach which emphasizes connections and communication between persons, and between people and nature (Kagan, 2011).

Of course, as an important manifestation of classical modernity, art has contributed to this unsustainable culture in its own way by way of unstainable methodology in creation, material selection, maintenance, life-span of the artwork, etc. Sustainability should thus symbolize the quest for a path out of unsustainability, which necessitates a diversity of sustainability cultures, but also a set of traits shared by these cultures. Cultures here are discussed as the culture of artistic expression in performance on global and local levels.

Additionally, analysis of the waste designing in this research as a concept of transformation within the context of sustainability is made along the lines of the Sustainable Development Goals 4 – quality education; 12 – responsible consumption and production; 13 – climate change; 14 – life below water; and 15 – life on land. It is against this background that I discuss the specific theories the circular economy theory, and theory of biomimicry as environmentalist theories, and the cultural sustainability theory.

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The theory of Cicular Economy (CE)

The term Circular Economy (CE) first emerged in the 1988 article *Biomimicry* by Allen V. Kneese. Pearce & Turner (1990), adopted the concept to describe an economic system in which waste is converted into inputs at the extraction, production, and consumption phases.

The CE theory has grown in popularity, thanks in part to the strong advocacy of the Ellen Macarthur Foundation (EMF) since its inception in 2010 (Nobre & Tavares, 2021), and partly because it incorporates practically all other related ideas like blue economy, cradle to cradle, industrial ecology, and even biomimicry (Geisendorf & Pietrulla, 2018). Through its international partnership with major firms like Google, Unilever, Philips, and Renault, the EMF was essential in spreading the concept throughout Europe and the Americas.

The CE theory has received significant attention in recent years. Because of the perceived necessity for improved resource efficiency, the number of academic articles and practical proposals based on the CE idea has expanded dramatically, with an exponential increase in CE research from 12 papers in 2008 to 2,300 publications in 2020. Scholars believe that the CE contrasts with the linear economy, which is built on a "take-make-dispose" pattern (Alcalde-Calonge et al., 2022; Geisendorf & Pietrulla, 2018).

This theory is particularly concerned with the irreversible loss of raw resources caused by the linear business model's increased uncertainty. While discussing waste generation in manufacturing, Lienig & Bruemmer (2017,

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p. 12), state that "entropy is increased further by mixing and diluting materials in their manufacturing assembly, followed by corrosion and wear and tear during the usage time. At the end of the life cycle, there is an exponential increase in disorder arising from the mixing of materials in landfills. As a result of this directionality of the entropy law, the world's resources are effectively 'lost forever'". CE is defined in contradistinction to the traditional linear economy.

For this reason, the CE theory proposes a production and consumption paradigm that incorporates sharing, leasing, reusing, repairing, refurbishing, and recycling existing resources and products for as long as feasible. In addressing global issues such as climate change, biodiversity loss, waste, and pollution which is the core call of the theory, the CE stresses design-based application on some fundamental principles. On the EMF webpage, three principles required for the transformation to a circular economy are outlined as: eliminating waste and pollution, circulating products and materials, and the regeneration of nature.

However, Suarez-Eiroa et al. (2018), add four principles and expatiate the locus of CE in sustainability to propose seven operational principles in total. These principles which serve as a guide in the production process of this art- based research include:

       i.   adjusting inputs to the system to regeneration rates Substituting;

      ii.   adjusting outputs from the system to absorption rates;

     iii.   closing the system;

     iv.   maintaining resource value within the system;

v.   reducing the system's size;

vi.   designing for circular economy; and finally,

vii.   educating for circular economy" (p. 959).

Limited resource supplies are drained as a result of the linear industrial processes of "take, make, and dispose" and the lifestyles that rely on them. These items and inventions with limited lifespans end up in landfills or incinerators (Alcalde-Calonge et al., 2022; Nobre & Tavares, 2021; Suarez-Eiroa et al., 2018). The cyclical method, on the other hand, draws on insights from biological systems. It believes that our systems should function like organisms, processing resources that can be recirculated into the loop, whether it is biological or technological, thus the description of it being a "closed loop" or "regenerative" (Alcalde-Calonge et al., 2022; Dörg et al., 2018; Geisendorf & Pietrulla, 2018; Gunderson & Wullschleger, 1994). This understanding is closely related to the tenets of Janine Benyus' biomimicry (which is discussed later in the chapter).

Circular development is inextricably tied to the circular economy, and it attempts to construct a sustainable society founded on recyclable and renewable resources, to protect society from waste, and to be able to form a model that does not assume resources to be limitless. In this sense therefore, CE resonates with the precepts of the functional theory of mineral resources which was propounded by Enrich Zimmerman; and metamorphosed into what contemporary followers of this theory would call, resourceship. Resourceship regards resources as a limitless entity that is dynamic and not

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static; is functional and operational, and is either made or created by the efforts of man. Erich Zimmerman who initiated the chain of thoughts in this resource matter states that "resources are not, they become" (1951, p. 15). Thomas De Gregori, adds that "in the process of becoming then, they are neither finite nor fixed" (1987, p. 1241).

According to Kirchherr et al. (2017), and Suarez-Eiroa et al. (2018), the circular development as a new economic growth model focuses on the creation of products and services while taking environmental and social costs into consideration. Circular development therefore aids the circular economy in the creation of new societies that are in accordance with new waste management and sustainability goals that suit the demands of citizens. The focus here is about building businesses and communities that are more sustainable in general.

From the many perspectives and broad generalization of what constitutes CE, Nobre & Tavares (2021, p. 10) attempt to define it as

> an economic system that targets zero waste and pollution throughout materials lifecycles, from environment extraction to industrial transformation, and to final consumers, applying to all involved ecosystems. Upon its lifetime end, materials return to either an industrial process or, in the case of a treated organic residual, safely back to the environment as in a natural regenerating cycle. It operates by creating value at the macro, meso and micro levels and exploits

to the fullest the sustainability nested concept. Used energy sources are clean and renewable. Resources use and consumption is efficient. Government agencies and responsible consumers play an active role ensuring correct system long-term operation.

It is at this stage that I will say the CE theory becomes relevant for my research. In that, value has been placed on resources that were considered waste and at end- of-life stage, and these materials were exploited to the fullest in terms of their ability to be upcycled, reused and repurposed, even in their already repurposed stage. Additionally, the theory entails engaging the societal and political structures in dealing with a holistic sustainable venture.

Since its inception, the circular economy has found a wide range of applications. This broad spectrum of applications includes, but is not limited to, industrial applications with both product-oriented and natural resources, as well as services, policy and practice (Kirchherr et al., 2017; Suarez-Eiroa et al., 2018) to better grasp the existing limits of the CE, strategic management for circular economy details and various outcomes such as possible re-use applications and waste management (Alcalde-Calonge et al., 2022; Kirchherr et al., 2017; Orhonen et al., 2017). The circular economy encompasses all industries and includes products, infrastructure, equipment, and services. It consists of technical resources – metals, minerals, and fossil resources – as well as biological resources – food, fibres, timber, etc.

The adoption of the CE theory for this research is also based on the

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fact that although it appears initially to have an economic agenda, it has been applied in diverse fields that assume levels of art and design. I consider the success stories of these ventures as worth emulating. An example of a circular economy within a fashion brand are DGrade (which has been discussed previously in this chapter), and Eileen Fisher's Tiny Factory. Fisher encourages the customers to bring their worn clothing to be refurbished or reconditioned and resold. Fisher believes that "we need to make less and sell less" (Fisher, n.d.) to surmount the challenge of "overconsumption" in the fashion industry. Her admission of the idea of 'overconsumption' rightly aligns with Kagan's culture of unsustainability which he claims is posed by modernism.

The circular economy has broadly been interpreted in the automobile sector as using recycled materials, remanufacturing vehicle components, and using renewable energy in the design of new cars (Automotive World, n.d.). And of course, in the plastic waste management industry, Nelplast Eco Ghana Limited goal is to convert tons of plastic waste collected from all across the city into building bricks that are used in building projects (Nelplast Eco Ghana, n.d.)**.**

With every theory, there is a loophole. The same applies to this theory under discussion. According to critics of the circular economy, proponents of the circular economy may exaggerate the potential benefits of the circular economy (Korhonen et al., 2017). According to critics, a future in which waste does not exist, material loops are closed, and things are recycled endlessly is, in any practical sense, inconceivable (Reike et al., 2018). That there is uncertainty about the level of sustainability of the circular economy

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juxtaposed to the linear economy and what its social advantages could be, particularly owing to dispersed outlines (Korhonen et al., 2017; Suarez-Eiroa et al., 2018).

Another important point is the conversation that CE lacks inclusion of indigenous discourses from the Global South which makes the conversation less ecocentric than it depicts itself (Geisendorf & Pietrulla, 2018; Prieto- Sandoval et al., 2018). In the analysis of data in this research, I make a modest attempt at discussing the process and findings in relation to the contribution of the global south to the discourse on CE. The angle of contribution is based on the mode of performance and the transformative nature the scenery possesses in its ability to be repackaged and used in other forms, the scenery to be reused in its original recycled state, among others.

The Biomimicry theory

Biomimicry or biomimetics, as a practice-based theory, has been explored and implemented as a sustainable technique in the domains of engineering, architecture, agriculture, medicine, and even information technology, with its history and development dating back to the pre-industrial revolution around 6000 BCE. However, Janine Beynus, a biologist, popularized the phrase with her publication of *Biomimicry: Innovation inspired by nature* in 1997. Biomimicry, according to Janine Benyus, replicates natural processes to generate innovative and sustainable design solutions. She also defines biomimicry as a discipline in which nature is viewed as a mentor and design model.

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J. Benyus (2012), writes that

> at its most practical, biomimicry is a way of seeking sustainable solutions by borrowing life's blueprints, chemical recipes, and ecosystem strategies. At its most transformative, it brings us into right relation with the rest of the natural world, as students learning to be a welcome species on this planet. […] Biomimicry is learning from and then emulating natural forms, processes, and ecosystems to create more sustainable designs (p. 2).

Instead of reinventing the wheel, biomimicry implies that nature has already addressed many of our issues. As a result, it seeks a deeper understanding of these systems in order to replicate them. Benyus correctly acknowledges the age-old habit of copying nature, alluding to her reinvention as "waking sleeping beauty. By that I meant biomimicry was not new to the human species…what I meant is that this latest appearance of biomimicry is not an invention, it is a remembering" (Benyus, 2012, p. 7). The goal of biomimicry operating within a sustainability context therefore, is to develop goods and procedures that work like natural ecosystem components while having no negative environmental consequences.

Instances have been that biomimicry is confused with bionics (Dickinson, 1999; Geisendorf & Pietrulla, 2018). In bringing biological approaches to the invention process of new technologies, bionics takes a more technological approach. Rubber would be offered as a resource in a

bionics approach to innovation, however biomimicry would advise natural materials, as plastic cannot be disposed of without external repercussions on the environment. Because of this, it is quite similar to the CE concept, but with a much narrower emphasis. Whereas CE opens its range to cover economy, environment, and recently, society, biomimicry focuses on the environment and its full potential as an inspirer.

The earliest reference of nature and biology serving as inspirers for some human creations and innovations is that of Leonardo da Vinci who painstakingly studied the anatomy of the bird and transferred that knowledge to designing human wings. Subsequently, John Stringfellow and the Wright Brothers who were keen bird-watchers would build upon Leonardo da Vinci's idea to create the first glider in 1856, and later, the world's first motor-operated aeroplane, respectively (Aplanet, April 2022).

In 1996, Zimbabwean architect Mike Pearce sought to reduce the building and construction field's contribution to carbon emissions. He thus designed the Eastgate Centre in Harare, Zimbabwe using the termite mound as a model and adopting its warming and cooling system. During the day, heat is generated by people, machines and the sun, which the high-heat capacity fabric of the building absorbs (Benyus, 2009; El-Zeiny, 2012; National Geographic, May 2018). In the evening, the warm internal air is released through the chimneys and cool air is drawn in at the bottom of the building. When the Centre is passively cooled, it uses only 10% of the energy of a comparable conventionally cooled building; and when actively cooled, it uses 35% less energy to keep the same level of temperature as a conventionally cooled edifice (Aplanet, 2022).

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Again, perhaps the most famous example of a biomimicry innovation is the Velcro, engineered by George de Mestral. The Velcro was designed against the physical makeup of the seed of the burdock plant, known as 'bur', which has tiny hooks that easily clutches to fur and soft fabrics. Since the late 1950s, the Velcro has been widely used as fastener and in possible other applications (Aplanet, 2022; Benyus, 1997, 2009; El-Zeiny, 2012; Pathak, 2019). While these examples and many others reflect how humans are gradually consulting nature in drawing up design solutions for humans, it is important to note that the topic of using waste materials as the main fabric for construction is missing in the discussion. The concept of waste is only majorly mentioned within the context of reduction during and after creation process. It is therefore implied, that the biomimicry design model is formulated, in the meantime, for use of 'raw materials'. This introduces a level of difficulty in adopting biomimicry as a design model for building purely using waste materials

Meanwhile, Benyus has categorized the teachable levels of nature into three – "nature as model"; "nature as mentor"; and "nature as measure" (Benyus, 1997, p. vii). In the first instance – "nature as model" – nature is the source of insight "into the quest for new ways to frame day-to-day life" (McGregor, 2013, p. 60). In nature, there only exists nested systems where each part of the system supports the existence of the other parts thus obliterating the notion of waste in nature's activities. Modeling this interconnectedness and interrelatedness would respect the needs of the other species.

In "nature as mentor" nature is a source of knowledge fit for imitation. Mentors are trusted friends, counselors or teachers, usually a more experienced person. Nature has had 4.2 billion of years to evolve and gain experience of living systems in evolving complex, efficient, resilient and adaptive systems. Humans would do well to watch and learn rather than exploit and destroy. McGregor (2013, p. 61), adds that "The answers are there in nature if we take the time to discover and apply innovations. Nature has figured out what works, what is appropriate and what lasts. Nature has a spirit of cooperation, flexibility and diversity that has made her a reliable and long-term survivor".

Using "nature as measure" we can then answer questions such as: Are they life-promoting? Are the actions taken in accordance with nature? What is the likelihood that the results or impact will last over time? It is at this point that the Nine Laws of Nature, as Benyus would term it, comes in: to judge the "rightness" of their innovations and decisions, people turn to nature for guidance. The operation of these teachable level reflect in this study as "nature as mentor", and "nature as measure".

In studying natural organisms and how they operate particularly in line with their ability to build shelters and recycle waste, nature becomes a mentor and a teacher. Secondly, in the application of the lessons learned from the 'teacher', the principles governing the shelter building and waste management becomes the measuring tool for ascertaining the viability and validity of the copying process as well as of the end product. So that in the end, the process used for production simulates the processes used by the organism identified, as well as a semblance between the product and the

particular features of the organism.

According to Benyus, nature provides nine essential operating principles that may be utilized as a model for human behavior. These rules, techniques, and concepts, she claims, have been shown to be consistent throughout generations and civilizations. More significantly, they may be observed by anybody who is interested in maintaining a high level of life in harmony with nature (Benyus, 2009). McGregor (2013, p. 59) states that "these life principles represent the intrinsic qualities of ecosystems". The nine essential operating principles of nature are outlined as:

i.   rewards cooperation

ii.   always fits form to function.

iii.   depends on and develops

iv.   recycles and finds uses for everything

v.   requires local expertise and resources

vi.   avoids internal excesses and "overbuilding" by curbing excesses from within.

vii.   taps into the power of limits.

viii.   runs on the natural sunlight and other "natural sources" of energy, such as wind.

ix.   uses only the energy and resources that it needs

In my opinion, the principles outlined present biomimicry as a near impracticable venture. Based on the observation that the mechanisms and the materials available for designing and processing cannot religiously fit into all principles, it behooves on the creator to stay true to the principles as

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much as possible or to adapt and work around to develop the discourse further. In instances where this concept has been claimed as a model, the trade-offs were visible. Mention can be made of The Eastgate Centre in Harare, Zimbabwe. This Centre was designed to be ventilated and cooled entirely by natural means.

While the Architect used the termite mould as an inspiration – nature as mentor, the machinery used in construction, which was majorly propelled by fossil fuel and electricity; energy supply, in which stance electricity plays out again; resources, which were not all sourced locally; and the generation of excesses, are all concerns that surround the production and function of this magnificent building. Indeed Mathews (2011), asserts that "observations such as that 'nature runs on sunlight,' for instance, and that nature 'banks on diversity,' are handy rules of thumb for designers, but in no way render nature intelligible to us—they do not fit together into an intelligible order" (p. 368). So, the question then arises: how much biomimicry is biomimicry? I attempt to find answers to his question in my latter analysis.

El-Zeiny (2012), Jamei & Vrcelj (2021), McGregor (2013), and Radwan & Osama (2016), have further defined the approach of the teachable levels that Benyus claims biomimicry presents into three expansive levels as: organism features, organism-community relationship, and organism- environment relationship.

Biomimetic approaches to design and sustainability have again been classified into two namely: top-down approach, and bottom-up approach. The top-down approach has been described in other ways as 'design looking

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to biology', 'problem-driven biologically inspired design' and 'challenge to biology'. Similarly, the bottom-up approach comes in terms such as 'biology influencing design', 'solution-driven biologically inspired design', and 'biology to design' (Aziz & el Sherif, 2016; El-Zeiny, 2012).

Nature imitation has become an option for design projects and provides the design process to be incorporated into the environment and surroundings. Although biomimicry presents some controversies and loopholes (as do most theories), it remains an essential model for designing in any field as it situates itself within the confines of the sustainability discourse.

The theory of Cultural Sustainability

The 1987 Brundtland Report has defined sustainability as the achievement of ecological integrity, economic well-being, and social justice. This definition misses the place of culture in how sustainability materializes (Hawkes, 2001; Kagan, 2008, 2011; Soini & Birkeland, 2014).

Jon Hawke's *The Fourth Pillar of Sustainability: culture's essential role in public planning* presents a precise definition of culture, analyzes its role within developing new planning paradigms, and recommends practical strategies for incorporating a cultural viewpoint into the public sphere. He demonstrates that the 'concept of culture is an invaluable tool that has been largely ignored in the attempts to reconfigure the ways that governments plan the future and evaluate the past' (p. 1).

Hawkes categorizes discussion of culture as sustainability in the folds – the meaning of culture; the application of culture; and the results of culture. The fundamental conclusion is that cultural vitality should be incorporated as one of the basic prerequisites, main conceptual principles, and overarching assessment streams in new governance paradigms and ideas of what defines a healthy and sustainable society.

It was Jon Hawkes' (2001) conceptualization of culture as a fourth pillar to the structured sustainability discourse that propelled the evolution of the many cultural sustainability theories existing today. His book, *The fourth pillar of sustainability*, lays the groundwork for understanding the place of culture in the years-long discussion of sustainability. Scholars and policymakers are increasingly recognizing the role of culture in sustainable development. Culture is also increasingly being debated in debates at the global, national, and municipal levels, and there are several initiatives led by local players.

On the one hand, some studies regard cultural sustainability in the light of galleries, libraries, archives and museums in heritage preservation, divorced of their role in sustaining culture through the three other key areas of preserving and promoting cultural identity, cultural diversity and cultural vitality (see for instance Harkonen & Vuontisjarvi, 2018; Loach et al., 2017; Pop et al., 2019).

On the other hand, the works of Dessein, Battaglini, et al. (2015); Dessein, Soini, et al. (2015); Duxbury et al. (2017); Kagan (2011); Kangas et al. (2017); Kirchberg & Kagan (2013); Soini & Birkeland (2014), endorse

the ideas articulated in Hawkes 2001 that in their understanding of diversity, sustainability goals should incorporate the vitality of cultural and creative expression, providing for a vibrant cultural life while protecting against cultural uniformity. Regardless, the substance of the literature is on sustainable transformation, across and beyond all of its dimensions and necessitates broad societal shifts.

Kagan (2008), suggests that the "'culture(s) of sustainability' approach aims to identify the characteristics of cultures that are able to evolve and sustain human development in challenging environments, and especially able to learn from crises and transform themselves accordingly" (p. 129). Derivative of this quote is the fact that not all cultural practices are worth sustaining should they pose a threat to the surrounding environment.

Again, Sacha Kagan's (2011) perspective on cultural sustainability draws examples of artists exploring sustainable approaches to cultural conservation and still describes how the modern culture of hyper-consumption degenerated into a culture of unsustainability.

Kagan & Kirchberg (2016) write that:

> There will not be a shift of civilization towards sustainability without a fundamental shift in contemporary culture away from a hyper-consumption oriented, hyper-industrialized, hyper-modern culture and towards a culture infused with an understanding of and a respect for life in all its complexity; a culture empowering people to change their lives in order to re-

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invent another, more sustainable "good life" that is inclusive of human groups until now oppressed or disadvantaged.

This school of thinking reflects the culture of overproduction and overconsumption of non-biodegradable things, which suffocate the environment. Whereas, as mentioned in this study, scenery design becomes a technique for fighting Ghana's garbage problem, it also drives the discourse about preserving the age-old cultural practice of storytelling. In this sense, the recycled waste materials become a resource for the designing and construction of the scenery for a play performance which is modeled against the Ghanaian storytelling format and characteristics.

An important addendum to the discussion on cultural sustainability that is critical to the course of this research dwells on procedural sustainability as a proponent of cultural sustainability. Although Kagan admits that the procedural definition of sustainability within the cultural framework "are not completely free-floating, nor reducible to a 'culturalist' dimension", he continues to argue that culturally relevant approach to sustainability should operate with a 'procedural' concept of sustainability where sustainability is the emergent feature of a dialogue about desirable futures" (2018, p. 131).

The claim that procedural sustainability is about re-inventing worlds, and is thus primarily a cultural project is very important to this research. In questioning the materials used for scenery construction, and experimenting

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with alternative materials, I attempt a 'reinvention' of the culture of scenic design, and within an indigenous context. Situating the procedure of design with the performance culture of storytelling defines the importance of imagination and reimagination, as well as establish an "interface of memories and futures in the production of social imaginaries and in the constant (re)negotiation of diverse goals and priorities" (pp, 131, 132).

Williams distinguishes three main meanings of culture as normative – discovery and description of values; performative – thought and experience in action, of language, form, and convention; and connotative – expression of meaning and values through art, institution and ordinary behaviour (Williams, 1998). In view of this, the cultures at play within this procedural sustainability are the indigenous art (performance of storytelling) as a normative culture; scenic design as performative; and the social reconstruction of environmental friendliness through the interaction between participants, performers and the performance becomes the connotative culture.

The Kangas, Duxbury and De Beukelaer's (2017) cultural sustainability model which are on two levels: (1) sustainability of cultural and artistic practices and pattern (identity formulation and expression, cultural heritage); and (2) the role of cultural traits and actions to inform and compose part of the pathways towards more sustainable societies is adopted for analysis of this thesis. This adopted model captures the conceptualization of *designing with waste*.

This model (figure 2.1) necessarily correlates with Dessein et al.,

(2015) thesis of culture as, for, and in sustainability. The discourse on culture as justice demands that all aspects of human existence be considered and implemented on inter, intra, and trans-relational scales, which is what makes the whole venture of sustainability appear fanciful.

Translating Culture into Waste Designing
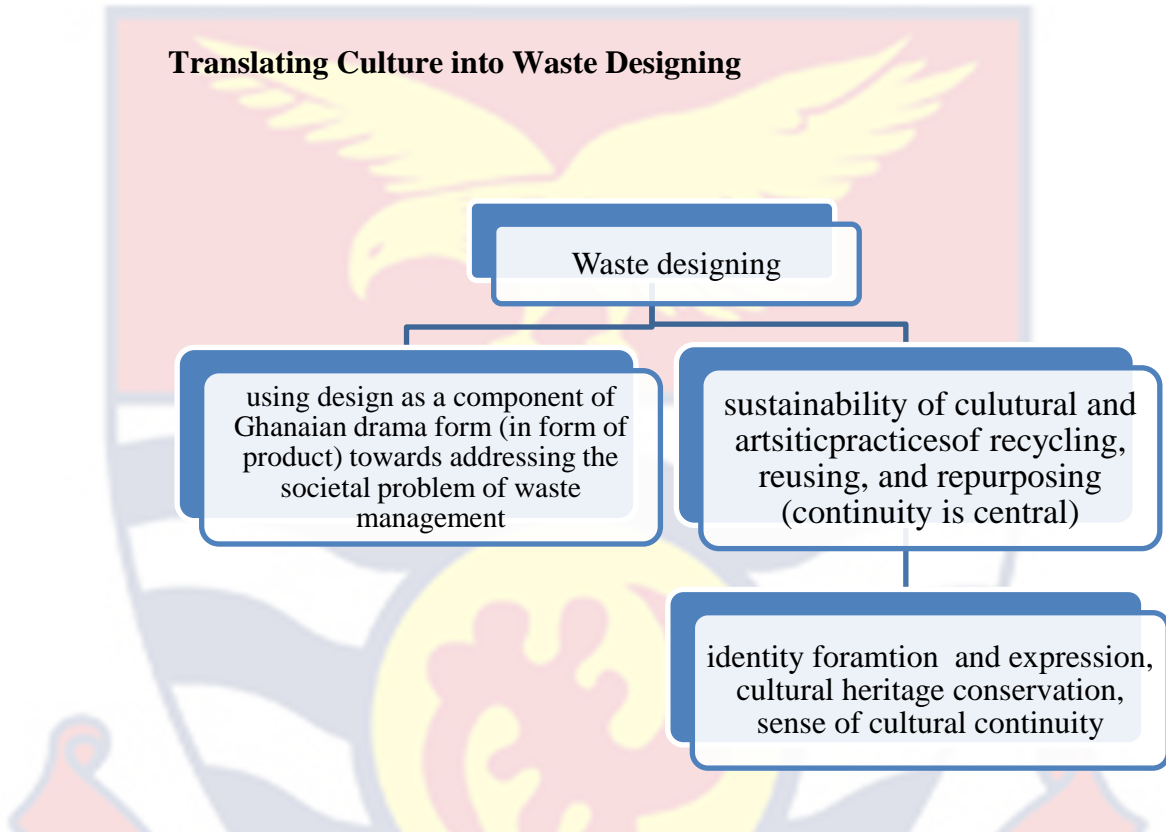
Figure 2.1. Framework of waste designing as cultural sustainability.
Source: Mawukplorm H. Adjahoe, waste designing, (2021)

Scenic design, as a result of the model, creates culture, which acts as a conduit for sustainable growth. By using waste materials as resource for the creation of set design, I begin a journey of transforming the narrative of designing for the stage. Through this transformation thus, a new identity is being established and conveyed, which encourages cultural conservation. Dessein et. al (2015) have also discussed culture in sustainability in three folds: (1) culture in sustainable development, where culture becomes the

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fourth pillar of sustainable discourse – economic, social, and ecological; (2) culture for sustainable development where culture serves as a mediator between the three pillars of sustainability; and (3) culture as sustainable development where culture serves as the foundation upon which the discourse on sustainability is built.

The second dimension (i.e culture *for* sustainable development) is the most suitable for the discussion in this research. This is because the scenery designed serves as a motor, a mediator for the ecological and economic dimensions of sustainability. In which sense, the project worked towards minimizing the quantity of waste that is injected into the environment by intercepting it from the waste generation sources while lessening the pressure on wood. For the economic dimension, the set for performance became a product which served both ways of earning money while saving the bulk of the expected budget. In performance, the aspect that consumes the majority of money allocation is the technicalities – costume, light, sound, and obviously set. While applying waste materials as the main resource for creation and building, cost was greatly reduced.

Chapter Overview

In this chapter, I attempted to establish the concept of scenic design within sustainable/ unstainable parameters through historical, systematic theoretical reviews of literature related to my study. The chapter opens with an introduction which gives a brief presentation of the pertinent matters of discussion in this thesis. Such sub-topic as 'defining the scenery design

provided insight into the varied definitions and classifications of what is scenic design and what constitutes scenic design. I equally elaborate on the different terms that this technical theatre element operates under. As is suggestive of the sub-topic 'Ghanaian scenic design in perspective' scenic designing is discussed from the Ghanaian scenic designers' understanding and application of methodologies in the practice of scenic design for the theatre stage. At this point, empirical evidence of a number of scenic designers from local perspectives juxtaposed to global perspectives, is brought to play.

Drawing from the evidence provided from both local and global perspectives, sustainability which bears the crux of this entire research, carries the remaining of the discussions of existing literature under such sub-topics as 'staging for sustainability'; 'creating sustainability through theories'; and 'translating culture into waste designing'. Theories and concepts are divulged under these sub-topics to include the theory of circular economy (CE) (Alcalde- Calonge et al., 2022; Geisendorf & Pietrulla, 2018; Suarez-Eiroa et al., 2018); theory of biomimicry (Benyus, 1997, 2009, 2012; El-Zeiny, 2012; Jamei & Vrcelj, 2021; McGregor, 2013; and Radwan & Osama, 2016) and the cultural sustainability theory (Kagan, 2008, 2011, 2019; Kagan, & Kirchberg, 2016; Kangas, Duxbury, & De Beukelaer, 2017; and Dessein et. al., 2015). The chapter then closes with a proposed conceptual framework of the new practice of waste designing which reflects the intricate and subtle views derived from the various theories and concepts applicable to this research.

CHAPTER THREE

SUSTAINABILITY DESIGNING: THE MODUS OPERANDI

Introduction

In this chapter, I discuss the general procedures designed and carried out in this research. I describe the gamut of major activities that were involved in the whole research process. Specifically, I address in this chapter, the research design, used in the study, the pool of materials that make up the population for this study, what constitutes the sample, and the procedure of generating the final sample size for the design work. Additionally, the process and tool applied in the development of materials for construction, and the construction process are discussed in this chapter. As set design is usually contextualized within a performance, the play production process is also discussed in this chapter as a method of generating data for analysis.

The Philosophy Underpinning Waste Designing

As part of the requirements as beneficiaries of the DAAD funded SDG-Graduate School, scholarship holders spent three months in the University of Hildesheim, Germany. The stay was to provide the students with the necessary facilities that will aid in the successful completion of their thesis writing in time. During one of the many research progress presentations held at the University of Hildesheim, Germany, a question

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was asked as to what exactly my story was beyond the sustainability of the environment. Momentarily, a clear-cut response eluded me and I mumbled something concerning the sustenance of a certain performance culture. But the underlying thought has been to deconstruct the pedagogy of scenic design at least within the University of Cape Coast, to affect in the shortest future, other academic institutions within the Ghanaian space and perhaps beyond.

Designing for the stage, and by extension, designing for the theatre, has been over the years closely marked by such discursive elements as visual rhetoric, symbolization, and semiotics in its presentation and analysis. But is not communication on some, if not all levels, the core mandate of any theatre performance? Students reading Theatre Arts are obliged to mount projects as part of the requirement of a Bachelor Honors degree. A common read of their project headings follows something like "a scenic representation of [title of play]"; or "a costume representation of [title of play]", in that order.

Completing my bachelor's a decade ago, my final year project, in which I designed a set for the production of Nanabenyin Kweku Wartemberg's *The Corpse's Comedy* (1977), employed the same format; and generations that were to come after followed suit. Not only are the students encouraged, through teaching, to abide by "the-director-has-the-final-say" clause in the theatre creation process, but also the materials established in the pedagogy limits the creation of scenery to raw materials. So much so that departments that are struggling to meet yearly budgetary demands are compelled to make provision for the construction of new flats

that last but only a year.

In the face of the many global discourses on gender and societies, economy and migration, environment and culture, politics and diplomacy, decolonization and education, etc., it is only prudent that at least within the local context, arts as a tool in research embodies elements beyond the the limits of the art for art's sake rhetoric in the projection and discussion of arts as applied research. It is therefore important that students are introduced to pedagogical items beyond the confines of symbols and rhetoric to enable them enroll in mainstream interdisciplinary/ transdisciplinary scholarship; to fully engage in '*glocal*' (global and local) discourses; and to make substantial contributions to finding solutions to '*glocal*' problems.

The discussion progresses on a transdisciplinary tangent that questions every stage, as well as provides congruent answers to the effectiveness of moving beyond the traditional, and to embark on new creative pathways. In the context that provision is made for addressing the creation of new cultures, the discussions likewise transcend the limits of material (un)availability and creation to cover the promotion of new performance cultures. On some level, this project is argued in line with poststructuralist ideals.

A poststructuralist way of thinking represents a retrospective critique of certain structuralist commitments (Denzin & Lincoln, 2018; Hurst, 2017; Rivkin & Ryan, 2004). Such commitments are outlined here as the structure of teaching and learning of theatrical design. Hurst (2017) stipulates that "Most poststructuralist thinkers first sought to establish new concepts in this

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domain to describe their novel way of thinking. Most later turned their attention to philosophical and ethical themes and, consequently, to emancipatory social critique".

Though I do not claim proficiency in poststructuralist thinking and theorizing, the line-up of activities in this project can only be considered along these lines as: establishing a new concept of designing with waste materials in the domain of theatre performance, finding ethical themes that promote sustainability in designing, and progressing to discuss on the promotion of renewed performance cultures that emancipate the designer for being confounded within the walls of a proscenium stage.

Methodizing the Process

Three major research paradigms exist that are commonly used by higher institutions as the methodologies for research, namely qualitative, quantitative and mixed methods. These approaches have been extensively discussed by many a research scholars (Cohen et al., 2000; Creswell, 2013; Leavy, 2017; Merriam & Tisdell, 2016; O'Leary, 2004; Sarantakos, 2013). On the face value, the difference between the three major research methodologies lies in the use of numbers and statistics, and field of studies they are applied in.

According to (Merriam & Tisdell, 2016, pp. 5 and 6), quantitative research basically "describes 'what is'; that is, how variables are distributed across a population or phenomenon, […] the facts and characteristics of a given phenomenon or the relationships between events and phenomena",

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and the focus of quantitative research is on "how much or how many, and the results are usually presented in numerical form". Meanwhile, the interest of qualitative research is "in uncovering the meaning of a phenomenon for those involved" and "in understanding how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences".

While Virginia Braun and Victoria Clarke produce an extensive list of the differences between qualitative and quantitative research in their book, *Successful qualitative research, a practical guide for beginners* (2013), they also provide simplified preamble to the discussion on differences. They opine that qualitative research "uses *words* as **data** […] collected and analysed in all sorts of ways. Quantitative research, in contrast, uses *numbers* as data and analyses them using statistical techniques" (pp 3, 4). By these definitions, it concludes then that mixed research method uses both words and numbers as data for analysis. (Creswell & Creswell, 2018) write that "Mixed methods involves combining or integration of qualitative and quantitative research and data in a research study" (p. 51).

Per the descriptions of the various research paradigms, the inclination of this research is towards qualitative research. This is because, I sought to, in this research, uncover the meaning that the process and techniques of scenic design hold for the performing arts community within the context of sustainability – cultural, social, economic, and ecological. While scenic design is a creation of a world for a performance, through an artistic interpretation, I again sought to recreate a world that reflected the concepts

of sustainability based on the meanings uncovered. Additionally, for the reason that this research did not deal with number as data nor did it use statistical techniques in analysis, this research is classified as a qualitative study.

In designing this research, the initial perception was to advance data collection, discussion and analysis under the qualitative paradigm based on the assumption that it qualifies as exploratory research from a humanities perspective. Indeed to a larger extent, this research could be considered as exploratory given that a "qualitative exploratory design allows the researcher to explore a topic with limited coverage within the literature, and allows the participants of the study to contribute to the development of new knowledge in that area" (Reid-Searl & Happell, 2012 as cited in Hunter, 2019).

Tagging this research as exploratory is based on the fact that a number of studies exist on the art and application of waste materials in the area of fine art and fashion. For instance, Contributors to the edited book by Mohsen Miraftab and Richard Horrocks, *Ecotextiles: The way forward for sustainable development in textiles* (2007), discuss recycling and using waste as a raw material in industries including clothing and carpet manufacturing. The book is replete with ideas on enhanced design, the use of sustainable textiles, and production techniques, as the writers examine sustainability and eco-design. As the chapters that follow discussed renewable energy sources and sustainable development, including composites created from textile waste, they also dealt with waste management in industries like waste from dyeing and sewage treatment. The book concludes with a review of cutting-edge technology, including that of

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brand-new textiles and finishing methods.

Similarly, Patty Wongpakdee presents five hundred (500) eco-friendly creations from around the world, in her 2014 *Art without waste: 500 upcycled and earth-friendly designs*. Aside from repurposing discarded items, such as bottle caps, gas cans, and skateboards, this book explores creative ways to utilize sustainable resources like wood, straw, and paper. It is an inspiring collection of works by artists who use eco-friendly principles such as upcycling to make their work more sustainable.

Several other examples exist in other art fields on the topic of sustainability. However, the dearth of literature and practice in the field of waste in scenic design and construction for theatre performances, particularly following the notion of biomimicry, explains the classification of this research as a qualitative exploratory research design. Yet, the same may hold true of other studies, in that the scarcity of information about a particular topic motivates additional investigation to add to the pool of knowledge in that very field. In this chapter therefore, I make an attempt to position the research within certain methodological paradigm, and discuss the developmental process that birthed the final design work. This will positively influence imminent literature on methodological applications in design work.

Designing the Research

As this research dwells primarily on artistic creation and output as a mode of inquiry, consideration is given to arts-based research design as a

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methodology. The decision to use this research design did not come easy as the need to *academicalize* the research became an earworm at a point in this journey. I contemplated the primary qualitative research design options (i.e ethnography, phenomenology, case study, historical, grounded theory, narrative research), including action research, which seemed at that time to be the closest favourable.

While both action, and art-based research are types of applied research, the art-based research design gives me the opportunity to explore my creative imaginations and to navigate the creative problem identified, to be able to experiment and build an evocative creative solution. Leavy, (2017) writes that

> […] a cornerstone of ABR practice is that it follows a generative and emergent process, open to the unexpected—to surprises, new insights, and bends in the road. So even when we have a plan for how a particular inquiry will proceed, in practice, it can and often *ought* to be a messy process (p. 191).

Although I had a fair idea of how to go about generating my data, I equally had my moments of doubts and uncertainty about the success of the project, primarily due to the fact that there was no template of such a project available for me to fall on. True to my fears, processes that I had carefully carved out from the beginning were not feasible and had to be altered a number of times. For this reason, there were a lot of improvisations, a lot of

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mistakes (particularly with constructing the materials) and revisits to the drawing table a number of times before arriving at the final design. Not only does this paint a picture of a messy process, but also proves Leavy's assertion true of the ABR as a process that is generative and open to the unexpected.

Additionally, producing, and analyzing an artwork is significantly subjective, which is nonconforming to the objectivity clause that manifests in the other qualitative research designs. By employing the art-based design therefore, the divide between "both the artist-self and researcher-self with the researcher and audience and researcher and teacher" is bridged (Leavy, 2020, p. 3). As theatre is a collaborative art, this research design afforded a forum for merging interests while creating knowledge. The choice of the art-based research design for this study makes up for these deficiencies posed in these widely aforementioned accepted modes of designing research because none of these designs provided the pristine definition of what would be considered the perfect guide.

It is said that ABR is also often employed in problem-centered or issue- centered projects, where the problem at the center of the research dictates the methodology. With a specific interest in the materials and construction process, the overarching problem that this research sought to find answer to is rooted in matters of sustainability of the culture of scenic design for theatre performances, in terms of the four pillars of sustainability – economical, environmental, social, and cultural.

Furthermore, literature on art-based research has revealed the

possibilities that lie in the application of art as a mode of inquiry, on which bases other arts/ artists/ educationists/ researchers, examples of which include Ghanaian researchers such as John Edmundson Sam, (known for his musical adaptation of Efua Sutherland's *The Marriage of Anansewa*, 2016), and Canadian scholars such as Susan Finley (who has written amply on art-based research, as well as its burgeoning contemporary, critical art based inquiry) have successfully conducted artistic investigations (Finley, 2011, 2018a, 2018b).

Building Sustainability with Art-based Research Design

Before delving into the specifics, I briefly draw a historical perspective on the use of the fast-developing research design. Art-Based Research as a methodological practice emerged from arts in therapy and arts in education fields with Shaun McNiff as the pioneer, first publishing on the subject in 1998. With their goal to establish "a more equal and logical partnership with psychology, in which art might sometimes take the lead as a mode of inquiry" (Prior & McNiff, 2018), McNiff argues that there are numerous concerns and problems to be investigated, all of which will necessitate a variety of investigative methodologies. It is therefore important to diversify the mode of inquiry, outside a single type of research, particularly within the creative arts community.

Coming from a creative arts therapy background, Shaun McNiff, in his book *Art-based research*, defines this methodology as an approach of enquiry

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which uses the elements of the creative arts therapy experience, including the making of art by the researcher, as ways of understanding the elements of the creative arts therapy experience, including the making of art by the researcher, as ways of understanding the significance of what we do within our practice (p.13). Art-based research is simply defined by its use of the arts as objects of inquiry as well as modes of investigation (p. 15).

McNiff discloses the biggest challenge of pursuing art-based research as its openness to boundless possibilities. Yet this challenge remains a strength of the methodology because in presenting a one way standardized definitive method of enquiry, researchers and researches will be ignoring the infinite possibilities that future experimentation may reveal (McNiff, 1998)

From McNiff's 1998 publication which lunged art-based research into gradual recognition as a methodological approach in academic research, the concept has garnered scholarly attention with a number of writers modifying, revising, and adjusting the method into varied terms. Some of these terms include performative inquiry, artistic inquiry, a/r/tography (a/r/t is an acronym for artist–researcher–teacher), critical arts-based inquiry, poetic science, Research-Based Art (RBA), aesthetic research practice, etc.

Although these scholars have discussed these terms as having some

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distinguishable individual traits, the general characteristic of the methodology embodies the definition that art becomes the basic mode of inquiry in addressing the research questions, whether it is an original investigation through practice to gain new insights, or is interested in the nature of the practice that results in new knowledge that is useful to that practice (Candy, 2006).

Art-Based Research (for brevity, referred to as ABR) has thence been expanded to include other art researches that are not solely for the purposes of therapy. Patricia Leavy whose methodology writings broadly concern ABR, defines it as a practice in which "a set of methodological tools used by researchers across the disciplines during all phases of social research, including data generation, analysis, interpretation, and representation" (Leavy, 2015).

These tools herein provided are wide-ranged including:

> […] literary writing, music, dance, performance, visual art, film, and other mediums. Representational forms include but are not limited to short stories, novels, experimental writing forms, graphic novels, comics, poems, parables, collages, paintings, drawings, sculpture, 3-D art, quilts and needlework, performance scripts, theatrical performances, dances, films, and songs and musical scores (Leavy, 2015).

The provision of the inexhaustible list of possible tools used in the

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data formulation and analysis in ABR as given by Leavy, aligns with McNiff's assertion that structuring the modus operandi of this research strategy will only limit the endless possibilities it may have to offer. This is because although all these tools are for artistic purposes, their gains transcend arts, and their forms of representation may differ from the conception stage to production phase.

There are debates about whether ABR is a unique form of research or a design belonging to the qualitative research paradigm. Scholars agree that it is the openness of the methodological strategy of building data and presentation that creates the forum for questioning its credibility as its unique methodology (Barone & Eisner, 2011; Leavy, 2015; Leavy, 2017; Merriam & Tisdell, 2016).

Arguably, ABR has been used at some stage in data collection during qualitative research, likewise, qualitative research rudiments are being employed during ABR. In this study for instance, this research strategy embodied most parts of the process. However, during the main evaluation stage where colleague scenic designers were interviewed, an audio-visual recording of the theatre production served as the basis for further discussion. Nevertheless, for this research work under discussion, the ABR is employed in its capacity as a design within the qualitative research paradigm. In the following subtopics, I discuss the specific methodological elements and tools employed in the research process, as well as the questions and the objectives undergirding this artistic study.

Employing Theatre as Mode of Inquiry

Looking beyond theatre as an art form meant to entertain – as has been the understanding of many uninformed people – is the central consideration of this research. This study questioned the sustainability of the culture of scenic design. With the questions grounded in what can be referred to as environmental studies, theatre became a means through which society is informed on the effects of waste on the environment and economy, and the possible ways these effects may be averted. Building on the metaphor of the world as a stage, "theatre, drama, and film are powerful mediums of communication and can be used as highly impactful approaches for investigating and representing human experience" (Leavy, 2020).

There are four major design components of a theatre performance namely light, costume, sound and scenery. In this research, I used the scenic design component to address issues not only on the environment, but on the economics of implementing scenery for a theatre performance, and how the practice could contribute to the discourse on cultural sustainability. Applying the tool of theatrical performances for the benefit of this research presented a forum to exercise my own artistic skills and goals to create an art form that resonates with the concept of theatre activism. Theatre activism here means an art-form that "not only reflect or mirror contemporary social and political turbulence but also exemplifies the potential ability of the performing arts to generate a process of change at the individual and/or societal level" (Pal, 2010, p. 49).

A piece of music, a piece of art, or a piece of theatre can act as a

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form of defiance, a form of resistance, or even just a bridge of reconciliation. In this sense, resistance to the effects of climate change can be achieved by adapting and implementing innovative sustainable production methods. By expressing themselves creatively, artists and communities can transcend certain boundaries, inspiring individuals to see their potential and that of the world. By way of using waste materials as the basis for material creation – while filtering the design conceptualization and its actualization through adopted scientific models and ideas – an attempt at breaking certain boundaries of scenic designing for theatre performances was made.

Through the preparation of the materials for the scenery, the construction of the scenery for the performance of the play *The Marriage of Anansewa: The Musical* (originally written by Efua Sutherland, and adapted by John Edmundson Sam), and the performance itself, data is generated and analyzed. All the while, the performance maintained its representational form. In that sense "performance is therefore an investigation and a representation" (Leavy, 2020).

Sources of data

In this research, I employed both primary and secondary data sources in the investigation process. Library materials – e-books, hard copy; videos and blogs on the internet, social media platforms – YouTube, Facebook served as the secondary source of data. These materials served as the foundation for building the literature for which the research gap which was

identified during practice and observation was confirmed and concretized. From the library materials also, the theoretical and conceptual structures were framed. I classified the building of primary data for this research under two stages – generating data based on artistic inclination; and collecting data as an evaluation based on the artistic presentation.

Generating the data

As a basic research, the focus was on gaining insights into what, and how waste materials could be employed as alternatives to the traditional materials of wood, and sometimes metal, and other plastics. Establishing familiarity with the subject area lays the foundation for a more rigorous investigation later. The process of generating data began with conceptualization of the scenic design for the performance of *The marriage of Anansewa: The musical*.

This stage involved idealizing and selecting the performance space and sketching of possible designs to fit the performance. In effect then, a number of possible scenery manifestations were produced devoid of knowing the exact kinds of materials that would be used for the construction. This created an avenue of possibilities of what materials to explore and experiment with to achieve my goals.

While idealizing the scenery, attempts were also made to develop plans of how to craft the building blocks that would make up the structure of the scenery designed. In developing these plans, the theories of biomimicry and circular economy were considered. Firstly, the basis of biomimicry is to

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find solutions to human problems by replicating nature's processes whose way of existence bears on the problem and solution at hand (Benyus, 2009). By virtue of the fact that the research gap aligns with construction processes, a number of organisms were selected.

In consultation with Mr. Kwame Sakyi Nyarko-Jectey, a Molecular Biologist, three organisms were selected for further investigations into their mode of sustainable construction. These organisms were the bird, the bee, and the spider. The reasons for choosing these living organisms for further investigation was their construction capabilities of building strong and long-lasting structures, while recycling at certain instances; and the seeming impression that their construction processes could be easy to mimic.

To be able to model the building of a nest, two moulds were designed and sent to the blacksmith for building. At the outset, the material intended for building the moulds was clay. This was then to be placed in a kiln for the casting. However, a visit to a bead maker in Elmina prompted a change in plans. According to him, the clay mould could not be made into the size that I wanted because it could break.

Accepting to build the moulds according to the bead maker's usual size would increase the number of castings required to construct the scenery, which was something I was trying to prevent because of time constraints. The individual moulds which measured one foot by one foot in width, and six inches in height were designed to look like an 'S' when interlocked with each other. This was to be used in casting plastic blocks which would be layered into a wall- like structure to form the outline of the stage.

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Sorting and testing the waste materials

In the process of collecting the waste for fabric construction for the scenic design, all waste materials – non-biodegradable and biodegradable – were pooled under the assumption that not all materials were recyclable, likewise not all materials would serve the purpose of scenic designing. Thus, a variety of 'waste' materials was sampled, tested and determined as to which was appropriate for set creation. The explorations of waste resources involved the manipulation of one or more of the same kinds of waste, as well as manipulations of one or more different kinds of waste. In qualitative research terms, the general collection of all waste materials – non-biodegradable, and biodegradable – became the population for the artistic study, out of which plastic, glass, sawdust, and paper were finally sampled.

The waste materials were sorted by grouping under the same classifications. Grouping them in like manner was to enable easy testing and to afford the knowledge of weakness and strength, compatibility and non-compatibility, as well as sustainability and unsustainability. Biodegradable waste was limited to plant based waste such as leaves (mango, soursop, and guava leaves), dead branches, the coconut bark husk, etc. Testing of the waste materials to determine the best ones fit for scenic construction involved shredding, melting, gluing, sewing (in the context of the dead leaves and coconut bark husk), ironing, casting, scorching, perforation, and stringing.

There were three processes involved in the design and construction of this project. The first process was applied in creating the materials for

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building the scenery, based on nature's principles. In applying biomimicry in this project, the top-bottom or the problem-based design approach was used. In this approach, I first identified the problem and sought the advice of biologists in consulting biological structures that have solved similar issues. As a problem- based approach moves from step to step, in practice, the output from later stages frequently influences outcomes from earlier stages, providing feedback and refinement loops as the process moves forward. Regardless of this, Michael Helms, Swaroop S. Vattam and Ashok K. Goel suggested a six-step problem- based design approach which is illustrated as:

Figure 3.0.1. Six-steps of problem based approach as suggested by Helms, Vattam and Goel (2006) as seen in El-Zeiny (2012, p. 506)

The second process is known as the cyclical pattern of activities in design as submitted by Stroud Cornock, and it was used as a tool for generating the data predominantly for the making of the building blocks for the scenery construction. Cornock identified these stages in design through the analysis of the working experiences of his Fine Arts students, and has thence been adopted as a model for making art.

This six-stage model was reflexive of a guide for experimenting with new ideas. As a scenic designer, it presented me with a step-by-step direction in preparing my materials for the implementation phase. Gray & Malins (1993), capture Cornock's model of the cyclical pattern of activities as:

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Stage 1: Generation – this involves manipulation of materials in the studio or a working space

Stage 2: Selection – at this stage elements of form and pattern which were identified whilst engaged in the generational phase (stage 1), are selected.

Stage 3: Synthesis – conceptualization and planning of piece of work begins at this stage

Stage 4: Articulation – during this phase, the problems or concerns emerging from stages 1, 2, and 3, are identified and contextualized where appropriate

Stage 5: Presentation – the ideas developed whilst engaged in stages 3 and 4 are presented so as to engage critical attention

Stage 6: Critical discussion – a discussion of the presentation which may generate new ideas to chain the stages into a cycle.

Scenic consideration and conceptualization

The third design process that was adapted for this project was to aid in the idealization and construction of the entire scenery for the performance. In creating a set that conformed to the precepts of the entire production, the seven- step design process outlined for technical designers was adopted. The design process which is generally a seven-step process suggested for use by theatre technical designers (Brewster & Shafer, 2011; Di Benedetto, 2012; Gillette, 2013; Wolf & Block, 2014) was also adopted in conceptualizing

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the design of the scenery. The steps may vary from one theatre book to another, with some deduction and some amalgamation. The general steps according to Gillette (2013, pp. 22 – 36) however remain as:

Step 1: Commitment – promise to do the best work as possible by accepting the assignment as a challenge and not as a problem

Step 2: Analysis – gathering information that will help clarify and refine the definition of the challenge; and identifying areas that will require further research.

Step 3: Research – background research and conceptual research.

Step 4: Incubation – time to let ideas hatch during which time the subconscious mind will use the time to sort through the information gathered in the previous steps and may construct a solution to the challenge

Step 5: Selection – sift through all of the data accumulated and decide to decide on a specific design concept. The scenic designer draws as many thumbnail sketches as necessary to explain the scenic concepts for the production.

Step 6: Implementation – phase begins when the designer stops planning and starts doing.

Step 7: Evaluation – takes place within each step of the design process, and it also occurs when the project is completed.

Developing the production

Under this section, I outline the activities that culminated in the production of the stage play of which the scenic design, which bears the crux of this study, is a component. The activities included: selection of the play text, review of play text for scenic considerations, studio citing, scouting for performance space, call for auditions, rehearsals, and building materials for scenic construction, theatre performance, and evaluation

Because the project was planned during a time when the Coronavirus pandemic was at its peak, there were suggestions to simply exhibit the structure alone without the rigorous inclusion of a play performance. However, solely exhibiting the set designed would cause a loss of an essential proponent of the existence of a set in the first place. The main purpose of set construction lies in its functionality to serve first as a created environment for a performance, and to relay silent or unspoken messages to the audience/participants of the performance.

Play selection

The general guiding principle for the entire production was sustainability: of environment, of culture, of economy, and of society. My interest was equally in reproducing or adapting the African indigenous oral narrative practice of story-telling through a hybridization process in an attempt to gratify both the old and new generations, and to conserve a dying culture. As was obvious of this reason, the search was hence limited to African plays that portrayed the concept in question. Moreover, in terms of

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promoting specifically the Ghanaian culture which is in this sense the art, folklore, clothing (including accessories), and music, etc., the population size was further narrowed down to only Ghanaian plays.

Of the Ghanaian plays which were modeled against the oral tradition, Efua T. Sutherland's *The Marriage of Anansewa* appealed to me best and ignited my creative imagination of 'contemporarising' the age-old art of story-telling. There were two versions of this play-text – the original version and an adapted version which was a musical. The adapted version was a Master of Fine Arts (MFA) final project work by John Edmundson Sam (Sam, 2016). It was first performed in 2015 at the University of Ghana, Legon, and published in 2016. In the spirit of contemporary conception, I opted for the adapted version.

Permission

Permission to use the adaptation for the project was granted verbally by the writer. In a telephone conversation with John, he acknowledged a verbal permission would suffice because of the cordial relationship I had with him. John and I were both colleagues during the days of our graduate programme and had initially casted me to play the role of Anansewa for his musical performance. The sequence of the play as well as its music thereof were not in any way altered. However, for the few particular sung dialogues that posed some level of challenge for the cast, they were cut short to be spoken instead of being sung. The spoken dialogues still made sense as they reflected a reversal of the sung dialogues back to their original states.

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Collecting the data

As a way of validating the method of waste designing as a promotional guide to the concept of sustainability in scenic design, I employed the purposive sampling technique to select individuals with high proficiency in the area of scenery design in Ghana to interview. The purposive sampling technique is applied to "choose subjects who, in their opinion, are relevant to the project" (Sarantakos, 2013, p. 164). The criterion for the choice of the respondents is their knowledge and expertise which informs their suitability for the research. A total of five participants were sampled, comprising three males, and two females.

Of these, only three were eventually interviewed because two of the participants were unavailable. The final sample size comprised one male and two females. Because the participants were not present during the performance, I played a recorded video of the production, upon which a major part of the interaction was based. The interviews were held via Zoom, and were recorded with the permission of my respondents. For transcription and thence to analysis, the Zoom recording served as the raw interview file.

The interview was conducted in an unstructured manner, with the use of an interview guide, to elicit their thoughts and understandings on the issue. According to Sarantakos (2013), an interview is unstructured when the questionnaire contains "a number of open-ended questions, whose wording and order can be changed at will. [...] The structure of the interview is flexible and the restrictions minimal, in most cases taking the form of guides rather than rules."

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During the interview sessions, the questions did not follow the order in which they had been arranged, rather questioning followed the line of conversation, what ideas emerged during the interview that required follow-up questions or otherwise, and the questioning format was not the same for all the sessions. In these interviews, I had the liberty to interact with my respondents based on particular study findings, (re)formulating questions as needed, as well as using neutral probing (Sarantakos, 2013).

Chapter Overview

The fundamental call of this chapter is the provision of the methodological processes that were applied in gathering and generating data for subsequent analysis and interpretation. It opens with a brief discussion of the philosophical underpinning of this study, which situates it within the poststructuralist/ post constructivist line of ideation. The reasons for this thinking is that this project sought to establish a new concept of designing with waste materials in the domain of theatre performance, find ethical themes that promote sustainability in designing, and progress to discuss the promotion of renewed performance cultures that emancipate the designer for being confounded within the walls of a proscenium stage.

Methodologically, this study is discussed in this chapter to possess characteristics of art as a research tool. The Arts-based research (ABR) is employed in its capacity as a design within the qualitative research paradigm. Drawing from a historical perspective on the development of the ABR, theatre and for that matter scenery design was employed as a tool for

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inquiry in this study. Through this approach, preparation of the materials for the scenery, the construction of the scenery for the performance of the play *The marriage of Anansewa: The musical* (adapted by John Edmundson Sam), and the performance itself, data is generated and analyzed.

Two dimensions of gathering data for this study are discussed here as being on two levels: generating data (through theatre performance), and collecting data (through interviews of some selected Ghanaian set designers). Additionally, specific procedures that were followed in generating and collecting data were also discussed. Methods of such include the Cornock's cyclical pattern of activities, and the seven-step design process (Gillette, 2013).

Discussions also bordered on how the production was developed: from play selection to seeking permission to the final rendition of the performance. Methods are reflexively discussed with the theories established in the previous chapter to produce a composite understanding of how each element of this study influences and affects the other.

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CHAPTER FOUR

THE SUSTAINABILITY PATHWAY IN DESIGN: CREATED OR CREATING?

Introduction

As with the general make up of this study – being divided into two sections: the first was the practical component which was undertaken to generate and gather data, and the second is the thesis writing – so it is with the analysis component of this thesis. The foremost chapter for the analysis of the data encompasses the different facets of sustainability and how they synthesize with the data generated. This level of discussion and analysis captures the concept of the "R's" and its various representations in the promotion of ecological sustainability. Practical methods in biomimicry; their implications, limitations, and solutions are as well discussed in this chapter. At the level of synthesis, these major variables as in sustainability and biomimicry are brought together to establish their general meanings, relationships and the interconnectedness between them. At the level of representation, figures are provided to give visual summaries and aid in the discussion of results.

'R' is Towards Sustainability

The concept of sustainability has been widely discussed in the previous chapters, drawing on other relatable theories that maintain a

connection, close or otherwise, with the concept. The theory of circular economy (CE) for instance remedies an unsustainable culture of overproduction and overconsumption by manifesting a structure of maintenance of a particular product for the prolongation, as much as possible, of its lifespan before finally reaching the incinerator. The method of sustenance presented here hinges on recycling, reuse, reducing, reclaiming, and reconditioning – a validation of the five 'Rs' in greening and techniques of waste management as a way to sustainability.

Differing views of what constitutes the four Rs are evident in literature. In some instances, the Rs are captured as Reduce, Refuse, Reuse, Repurpose, Recycle, in other instances, it is with other fill-in words such as, Redesign, Recover, Rethink, Repair, Refurbish, Residue, among many others (Doble & Kumar, 2005; Ekins et al., 2003; Salifu, 2001). Such terms have their definitions and contextualization in their use in the various literature. In most cases the terms repair, redesign, and repurpose appear on the frontiers of research in engineering (see for example Foster et al., 2014; Lepawsky et al., 2017; Lundquist et al., 2020; Standridge & Corneal, 2014) where lithium batteries, electrical gadgets, as well car parts are repaired and used for purposes of building a new design for another gadget. Meanwhile, reduce and refuse have become more or less generic terms used in almost all fields to suggest the control of the quantity of products used to result in lesser quantity in waste generation.

These terms may present standalone definitions in some instances, yet they are all interconnected in the spirit of recycling. The basic understanding posited in these varied terms is the promulgation of the

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longevity of products and resources through the process of recycling. While manufacturers and scholars more often than not distinguish between these terms I am of the view that, all these terms represent ways and techniques that amount to recycling. This way, recycling becomes a broader concept under which these terms fall, or better still, the end of product of the many ways applied to keeping a product longer in its cycle of existence. Jørgensen (2019, p. x), affirms that "Recycling is one of the many concepts that refer to how we deal with matter about to be discarded. We can reduce, reuse, renew, refuse, recover, repair, restore, or reclaim; each of these represents one way of dealing with waste."

The Cambridge Dictionary (1996, p. 1188) simply defines recycling as "to collect and treat used object and materials that are ready to be thrown out in order to produce materials that can be used again". Although simplified enough, this definition offers a rather limiting understanding of the term manufacturing. However, the term has a social, ideological and value connotation that the dictionary meaning does not provide. People who pursue recycling have certain ideologies that inform even their choices of materials to recycle, which could be social, economic, or environmental. An interesting consideration of this widely used term is the description offered by Finn Arne Jørgensen in her book entitled *Recycling*.

Jørgensen (2019), again considers the concept of recycling from two perspectives. On the one hand, is the technical perspective where she says that recycling is "a series of processes, or an infrastructure, that includes collecting recyclable consumer and industrial materials and products, sorting and processing the recyclables into raw materials, and manufacturing

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these raw materials into new products." The clause 'recyclable consumer and industrial materials and products', with the emphasis of 'recyclable' reckons that not all materials are recyclable.

During the testing of the biodegradable waste, an intriguing observation was made. Because these were natural raw materials which had not undergone any artificial processing, they were very malleable and easily responsive to manipulations. Although the use of these biodegradable materials would reinforce the application of the circular economy theory of recycling and reusing (by nature as the objects would rot to become food for the plants), the testing process again revealed a rather unsustainable economic venture. In that, without the assistance of any machinery, the use of these materials for the purpose of scenic designing was time and energy-consuming.

They say 'time is money'. If it is so, then with such limited time coupled with little to no technological support this exercise was impractical at that moment considering the fact that, by virtue of the small sizes of the leaves, a substantial quantity would be required for gluing and sewing to arrive at the desired size of scenery. At this point, the concept of value comes to play. While the materials may be of great importance for other processes, on the account of lack of time, and lack of mechanical aid, they had little or no value for the project. These materials lost their 'secondary' worth because they could not serve my design purpose thus making them insignificant. Yet again, Jørgensen's addition of seeing waste on this hermeneutic level as having "ideological and cultural components" (2019, p.

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ix) is what underscores the principles of 'resourceship' which equally sees the making of a resource "one that is as much ideational as it is material" (de Gregori, 1987, p. 1241).

It is indicative of this functional theory of resources that resources, in their limitless availability and capability, perform the function of a means to satisfy an end; that when the end changes, the means must also change. Resources, then, are not static. Instead, the fluidity in resource creation lies in the value attached to the particular phenomenon and operates within a function of space and time. This is what Zimmerman means by "resources are not, they become" (1951, p. 15).

Many theatre production houses are adopting light designing as an alternative form of scenic design: what is known as virtual scenery. However, within the Ghanaian space, electricity generation is costly and power supply is erratic. Generators must be secured and fueled, ready to serve as substitutes in the event of power outages. Acquiring the materials for the virtual scenic design is equally costly, as most of them are imported.

When all these considerations come together, the realization is that economically, the venture is nonviable particularly to academic institutions and budding production houses which exists on a very limited budget. Meanwhile, there is a growing concern about waste generation and management. Value is therefore placed, in this case, on the waste products to serve as an alternative material to scenic design and construction both within the physical sense (wood, metal, fabric, plastic, etc.) and the virtual sense. The most significant specialty of the theory is that resources are

functional and operational, made or created by efforts of man, and, dynamic and not static.

To gather the materials that I needed for *recycling*, I visited a total of seven highly patronised resorts and eateries within the Cape Coast metropolis and its neighboring town, Elmina. During one of my trips to one of the restaurants to collect the waste, a colleague of mine questioned: "why not gather the materials from the dump site since that is where the core of the problem is, to save yourself time and energy?" While that became an option at a point in the project, the decision to use these spots as my data-gathering centres was informed by three convictions – interception, education, and health.

Firstly, the problem of waste is not the dump sites, landfills or the incinerator. The problem of waste is the point of its generation. For waste to heap at a particular site, allowing diseases to fester, then it should have moved from its production source to the dumpsite. If that is the concern, then there is the need to prevent that movement in the first place, if possible. Based on this premise, I contacted the managers of the selected centres to share my research idea with them. In the process of establishing a relationship with the managers and workers of the resorts, I realized that some of them knew and understood what recycling and waste management are, while others had no clue whatsoever.

Again, among those who knew about recycling, they were those who practiced it in their own small ways, and those who could care less. To think that these people live in the urban towns and cities reveals the need to

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increase awareness on matters of waste, segregation, recycling, and environmental sustainability in general. One may argue that in this 21ˢᵗ century with advanced technological innovations, and globalisation, people would be up to date with environmental issues. However, it was the opposite.

In one of the many interactions with the workers at my collection site on the Elmina-Cape Coast highway, one of them confirmed his knowledge of possible recycling of their waste products, although he could not mention any product made from recycled waste materials. He nevertheless claimed that waste segregation demanded too much effort for which reason their waste bins that are picked up by *Zoomlion* (the most famous and leading waste management company in Ghana) are a mashup of bio-degradable waste, food waste, and non-degradable waste.

In the same space, I enquired about the major kinds of waste produced daily. It turned out as the obvious: plastic and glass waste. The manager confessed that he headed a business venture, therefore he had to flow with the demands of the people for the business to thrive. He added that, because most of the sought after beverages were packaged in disposable glass and plastic bottles, the waste generated doubles during the festive seasons which tends to be the peak seasons for these resort ventures. The waste receptacles overflow, which sometimes demands that they openly burn the rubbish heap particularly when the waste management company takes days to remove the waste.

Things were however a little different in some of the restaurants on

the University campus which also served as one of my waste collection centres. In one of these restaurants one of the workers led me to a space where they had separated the plastic and the glass waste from the food waste, neatly bagging them in jute sacks. He revealed that the waste had been packaged at the request of someone who also needed it for a recycling project. Occasionally, they separated the waste knowing that people often come to them for, predominantly, the plastics. Other than that, on a normal day, their bins would be a jumble of food, glass, plastic, paper wastes, etc., until the University's garbage truck picks them up.

The perception and practices of some of the business centres that were contacted revealed the need to *rethink* not only the kinds of product and product packaging procured for mass consumption, but also to rethink the practice of waste mashup which makes recycling cumbersome, and poses health problems to individuals and institutions that are engaged in recycling. A lot of the beverages are packaged in disposable plastics and glass (soft drinks, cider, and liqueur). Although some of the plastic bottles could be reused, because of the space within which they were used, consumers tend to discard them right within that space. Other consumers also crushed and flattened the empty plastic bottles so that they can only be *repurposed* or *redesigned* through factory production.

In a documentary video of Nelplast Ghana Limited (famously known for the manufacturing of plastic bricks in Ghana), which was featured on the Eco Africa channel of the Deutche Welle Television (DW TV), some workers of the recycling factory were shown to be sorting the plastic waste without any form of protective gear. Meanwhile, these plastics are gathered

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from dumpsites which have had years in their formations, most of which engulf their surroundings in pungent smells. The absence of protective gear consciously or unconsciously could pose health issues for the workers: the gatherers and the sorters. The documentary which is entitled "Getting people in plastic houses in Ghana" shows excerpts of the production of plastic bricks at the Nelplast Ghana Company Ltd. I had intended on interning with Nelplast Ghana Company Ltd., to gain insight into how to sustainably build recycled blocks, and to acquire the necessary skills for the easy creation of the frames for the scenic structure. They however abrogated communication with me after the initial exchange of emails and telephone call.

The purchase of one-time-use or disposable products by these businesses is non-reflective of the principles of the circular theory, and does not auger well for a healthy environmental lifestyle. One of the principles of the CE describes "an economic system that targets zero waste and pollution throughout materials lifecycles, from environment extraction to industrial transformation, and to final consumers, applying to all involved ecosystems" (Nobre & Tavares, 2021, p. 10) with the high dependence on disposable product packaging, the waste economy is ingested with far more trash than the recycling institutions can carry. This implies that a lot of the waste go unrecycled and find their resting place in pockets of dumpsites, and finally get washed off into the water bodies to cause harm to the organisms inhabiting these water bodies.

On this basis, the waste collection process was used as an educational forum to casually introduce the topic of the reusability of product packaging, and recycling. And to impress upon the workers and

management of the resorts and restaurants the gaps in their procurement process that eventually, as a matter of sanity of the ecosystem, may need taking a second look at, and to seek alternatives. The opportunity to educate and remind people of the effects of plastic pollution and the need to rethink our actions was my second conviction for using these resorts and eateries as the source of waste collection.

In the spirit of taking second looks, transcends these business centres to act on policymakers and stakeholders such as the Environmental Protection Agency (EPA, Ghana) to *redesign*, formulate and implement some policies and stringent measures that would go a long way to protect and preserve the environment from further deterioration. In the official policy document of the EPA, Ghana, the waste that seems to be of great concern is hazardous waste, to be followed by electrical and electronic waste.

Clear classification and provision for all other kinds of waste is missing in this document as they are all lumped together under a rather scattered description of '*and other waste*'. Priority is therefore given to the control of these 'hazardous' wastes which are basically defined as pharmaceutical waste and waste generated during the production of dye and treatment chemicals in this document which is entitled "Hazardous and electronic waste control and management Act 2016".

Yet the growing global concern of environmental agencies and activists is that plastic waste affects our lands and waters

[…] as a large percentage of marine and land

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creatures have died due to the fact that plastic is non-biodegradable and it causes hazards to soil. It also emits toxic gasses when exposed or heated up. It blocks drainage lines and fill up land space causing floods and erosion […]. Plastics wastes are also harmful to human health; they may contain harmful acids which may lead to death (Kehinde et al., 2020, p. 1).

While we currently live in the polymer age, the existence of this plastic operates in a rather negative dimension of circular economy. During the nineteenth and early twentieth centuries, scientists introduced synthetic plastics like celluloid and Bakelite into the manufacturing field as a cheap alternative for plastics made from plant, and were used for decades (American Chemical Society, 1993a, 1993b; Davis, 2015; Geyer, 2020; Parker, 2019). Since then, the world of plastics has been on a wild ascent, becoming an entrenched part of human lives, while the natural world has been on a speedy descent with its pollution being most visible in developing Asian and African countries.

Since the 1950s the global production of synthetic plastic has doubled almost every decade, measuring about 9.2 million tons. Much of these plastics are used in the production of single-use plastic products such as straws, grocery bags, packaging for products, etc. These single-use product are particularly detrimental as they are not recycled and end up as trash, constituting about forty percent of all plastic waste (Kaza et al., 2018; Parker, 2019). They end up damaging natural habitats, endangering wildlife,

and polluting communities around the world (Kehinde et al., 2020; Parker, 2019; Welden, 2020). This should be enough cause for the EPA to re-characterise plastics and other non-bio-degradable waste such as glass from the '*and other waste*' category to the '*hazardous waste*' category because they have become a threat directly and indirectly to human life.

This then brings one to the third conviction for using the eateries and the resorts as the collection point of the waste materials, which bordered on health considerations of myself as the researcher and that of my project assistants. This project commenced during an unfortunate period which saw the world come to almost a standstill with the spread of a deadly virus – the COVID-19 virus. The initial plan for waste collection, when the virus spread hit Ghana, was to contact close family and friends in and around Cape Coast, requesting of them to segregate their waste for my project purposes. The plan worked until I realized that time was quickly catching up with me, as I was far behind in preparation, and the materials gathered at that time were woefully insufficient for any design work.

At this point, anxiety set in, and the option of visiting the dumpsites for the materials became an obvious choice. However, a scrutiny of that option revealed the obvious, that the non-biodegradables will be thoroughly mixed with food waste such that by the time I get there for collection some may have even rotted causing the heap to be infested with worms. Secondly, with the rise of infection at that time, the possibility of getting infected through touching of probable virus infested products in an uncontrolled space was also considered. The unfortunate situation was I had no proper protection gear for this exercise. Health wise, this was unfeasible and posed

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a threat to the production team. I was therefore not willing to subject myself and my assistants to this hazard.

In *rethinking* my options, I settled on contacting these resorts for assistance, with the understanding that although these products may have been infected with the deadly virus, waiting to spread to the next person, the collection would be done in a controlled environment, and washing the materials would be simpler. This implied that, not only was the sanity of our health placed under check with the choice to use these centres as collection points, but also presented a rather effortless enterprise to *recover* products that were considered waste while *reducing* considerably the amount of waste that would have been added to the dumpsites and landfills. The occasion of rethinking choices created the opportunity to examine and explore design concepts that exist beyond the theatre box. The result of this rethinking of ways to create a more sustainable set design for a performance is the option to experiment with a rather scientific methodology of biomimicry.

To Mimic or not to Mimic: Man's Problems and Nature's Solutions

Throughout its creation, nature has always existed within a constant flow of activities through which other forms anticipate their existence. In nature's natural occurrence, nothing is considered waste. A waste flow from an individual organism becomes a resource for another organism or same organism. This is the inspiration behind Janine Benyus's idea of Biomimicry; that nature has (co)existed for billions of years and still

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counting without causing harm to other occupants of the earth, implying that nature is doing something right. Biomimicry stems from bio, which means life; and mimesis, which means to imitate.

Granting that scientists, engineers, designers and architects, agriculturists, among others are now able to clearly identify their projects with this burgeoning concept, the art of mimicking nature is nothing new to humans with its mimicry activities predating the industrial evolution. To put the matter in context, Africans and for that matter Ghanaians have long practiced this concept without tagging it with a particular name. In the area of housing and construction, a similar illustration can be drawn with the termites' choice of materials and construction techniques for their mounds.

A cursory look at the termite mound suggests one obvious material – clay or moist sand. However, for people like J. Scott Turner who has spent close to three decades (at the time of documentation in 2014) studying the termites, their mound transcends simple clay to depict a society of formidable architects whose works human beings can emulate for efficiency. The termite uses sand and dung in building its shelter. These termite builders bond the elements together using their saliva while laying one moist 'block' on top of the other until reaching sometimes as high as 17 feet and beyond. Although the mound may appear tough, they are actually porous: easily destructible by water (Margonelli, 2014; Terminix, n.d.). The termite mound is similar, on some level, to the mud huts.

Taking a closer look at the Ghanaian mud hut reveals tree branches, stones or pebbles, sand, clay, and dried elephant grass or old thatch. These

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materials are brought together in a process of pounding, mixing, and moulding to either form mud blocks, or used directly by creating layers of wet clay until desired height is reached. The sand, pebbles and old thatch function as reinforcement for the mixture to withstand easy disintegration after a heavy downpour, and to last longer against attrition. This way, when there are gaping holes or cracks in the building which may have developed from years of wear and tear, builders patch these holes with mud concrete and that holds the fort until the next repair is required. This is comparable to termites which are always scurrying to rebuild their mounds as fast as the weather erodes them.

The tree branches in the hut are considered as iron rods in today's sense of building construction. They are usually arranged both vertically and horizontally to serve as the spine and skeleton of the building, which strengthen the structure and prevents it from crumbling down. In both instances of the termite mould and the mud hut, when they are finally worn out, the materials are reused to rebuild another structure. In the event that the materials have finally worn out, they are allowed to reintegrate with the source from which they emerged. The reintegration of the 'waste' causes no negative side effects to its source because there is no introduction of synthetic materials and the construction process was all natural.

As one of the principles suggested in the application of biomimicry, reuse of products as a sustainability concept was practiced in Ghana in the earlier decades of the postcolonial era. Grocery shopping was done in baskets which were either cane-woven or plastic-based, at other times aluminum basins were used. The kind of receptacle used for shopping spoke

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to a person's social status. Items bought were usually without packaging, thus were directly packed into the baskets, with the exception of liquids such as cooking oil, palm oil, kerosene, etc. In the case of these liquids, buyers were requested to carry along with them their empty bottles for refill or be made to pay for both the bottle and the content. And it was not cheap. For this reason, containers were cherished as priced jewels and kept in constant active service until they broke or were worn out completely.

In same vein, water for drinking and for domestic purposes were filtered using a clean foam and cloth and stored in huge clay jars or pots. A calabash was reserved to serve the purpose of the main cup that was used in fetching the water before pouring or distributing into other containers or calabashes either for drinking or other purposes. These same calabashes were washed daily and used for even serving visitors water. Until the pot is shattered, it remained the container that served the household. Cracked pots were re-crashed and pounded into a finer consistency, and used to make other clay objects such as earthenware bowls, flower pots, and even lantern holders. Ghanaian communities were then considered to be modeled on nature; they learned how to optimize rather than maximize; to consume moderately so as not to bankrupt their ecological capital.

With the rise in urbanization, industrialization, and increase in production and consumption of synthetic goods such as plastics and glass, most of these sustainable activities have disappeared, only to be found in the few indigenous (or local) homes found in rural settings. In a bid to maximize time and energy, unhealthy and unsustainable practice of the over consumption of already-made food, already-made (processed and treated)

water, already-made clothes, already-made food ingredients, etc., have conversely replaced a rather healthy cultural practice that sought to intentionally protect humans and their environment.

Presently the world of production and manufacturing seems to be on a speedy forward trajectory where nature's reserves are being abused, overused, and ill-used. In what Kagan describes as an unsustainable culture of hyper- production and hyper-consumption or consumerism, the hike in preference for already-packaged goods only increases the generation of both producer and consumer waste, which further destroys the ecosystem. Kagan establishes this culture as one that is ingrained in patriarchal stances. He quotes Fritjof Capra as saying that

> This glorification of material consumption has deep ideological roots that go far beyond economics and politics. Its origins seem to lie in the universal association of manhood with material possessions in patriarchal cultures [...]. The association of manhood with the accumulation of possessions fits well with other values that are favored and rewarded in patriarchal culture – expansion, competition, and an 'object-centered' consciousness (Capra 2002, p. 264 as cited in Kagan, 2011, p. 33)

The discussion of the culture of production and consumption from this point of view propels also a consideration of a religious perspective.

One that could be relatable to how historically Ghanaians locally managed their resources by sanctioning persons who flouted the rules governing the peaceful coexistence of man, nature, and deities. This is a thought for another discussion. Meanwhile, environmentalists have advocated and mobilized efforts to suggest ideas and models that would counteract the effects that this unsustainable culture has on the climate and ecosystem.

Janine Benyus's biomimicry comes as a way of saying 'going back to our roots'. The question that this section seeks to find answers to is whether the concept fits all disciplines; and at what levels is the concept applicable? Numerous projects have been captured as having been modeled against the concept such as the Shinkansen bullet train of Japan inspired by the kingfisher bird; the Eastgate Centre in Harare, Zimbabwe which was designed to be ventilated by natural means and was modeled against the termite's mound; and the infamous Velcro which was developed by George de Mestral through the inspiration of how burrs stick to his dog's hair (Goddard, n.d.; M. Pearce, n.d.).

There are incredible success stories of bio-mimicking, as there are unsuccessful ones as well. On the matter of projects that are unable to successfully execute biomimicry, Michael Dickinson stipulates in his essay on Bionics: Biological insight into mechanical design that

> Most engineering projects, however, take place
> successfully without any explicit reference to Nature,
> in large part because natural analogs do not exist for
> most mechanical devices. One would need to search

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far and wide for a natural analog of a toaster. Nevertheless, in recent years there seems to be growing interest on the part of engineers to borrow design concepts from Nature. But mimicking biological structures is not always easy (1999, pp. 1, 2).

Undeniably so, mimicking biological structures is not easy particularly when the attempt is being made in a discipline that is fairly new to the concept. Nevertheless, the reason for adopting biomimicry for this project, despite the possible limitations it posed, was the sustainability clause that the project embodied, in that, in using the waste materials as resource for scenic construction, the subject of advocating for a cleaner environment comes to play. Using the biomimicry concept equally breaks the barriers of concepts and theories that are available for designers to adopt in executing design projects. This design methodology or concept affords its practitioners the chance to return to learn from nature's ways and apply to creating solutions for human problems.

A return to nature: emphasis on the bird and the spider

In the many years of practicing theatre in my capacity as a scenic designer in Ghana, the common theoretical language spoken has bordered on symbols and semiotics as a tool for communication in performances. With designers encouraged to operate within the conceptual framework of

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the director, the tendency was that priority was sometimes given to painting and the general aesthetics, with little relevance placed on the activist power that all these components of theatre possess.

The other reason is that it provided pathways to transdisciplinary studies. Increasingly, academic research and non-academic knowledge are being required to address societal challenges through transdisciplinary studies. The notion of transdisciplinarity in this research plays out in the combination of an artistic enquiry and a scientific process to generate an artistic output. Designing for the stage is purely an art affair as it finds its essence in the theatre and performing arts.

The concept of biomimicry is a scientific concept that has been adopted to solve a number of problems primarily in the hard sciences. Even in the instances where biomimicry has been applied to artistic works such as in architecture, it is regarded as shallow biomimicry (El-Zeiny, 2012). This is because the designs usually only capture the outward form of the biological organism. Yet in the same breath, the form of an organism is included in the list of various biological elements that can be imitated, which in the long run still fully qualifies those architectural works to be classified and biomimicry designs (El-Zeiny, 2012; Jamei & Vrcelj, 2021).

It makes sense if the purpose of transdisciplinarity is to understand the world in all its complexities, which includes humans, non-humans, and nature. Managing waste and generating waste are two of society's major challenges. This is where the purpose of biomimicry comes in. It is said that a growing need for deeper innovation and inspiration led to biomimicry

(Mackinnon et al., 2020; McGregor, 2013).

Per the six-step bio-mimicking process (discussed in the previous chapter) the problem was first identified as the gap in construction for theatre performances that exemplified a lack of consideration for a sustainable environment. In putting the problem in focus, the reframed problem became thus: finding alternative materials and construction process for a sustainable ecology. I consulted with Kwame Sakyi Nyarko-Jectey, a Molecular Biologist who is currently pursuing his master's degree at the department of Molecular Biology and Biotechnology, University of Cape Coast. His was constructive in his assessment of the project in its entirety, and he assisted with some organism research that would be of benefit to the study. The initial discussion with Kwame followed the line of bird-mimicking.

According to El-Zeiny (2012); Jamei & Vrcelj (2021); and Mathews (2011) there are possible features concluded from an organism and its biomimicry, which may be analyzed using three levels. Each of these levels is concerned with a layer of the design of an organism. In the first level, which has to do with the organism features, aspects and properties of a creature such as a whole unit (formal attributes; structure, stability and gravity resistance; mutation, growth and lifecycle; construction materials and processes; self- assembly; morphology, anatomy, modularity and patterns; healing recover, survival and maintenance; etc.), could be mimicked.

In the second level – organism-community relationship – other

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features that focus on the relationships between an organism and its living community (self-protection; survival techniques; group management coordination; risk management; communication; hierarchy of community members; interaction with other creatures; etc.) are included for exploration. The third level, which captures the relationship between the organism and its environment, highlights systems and eco-solutions that can be concluded from relationships between an organism and its context/environment (adjustment to change; response to climate by cooling, heating and ventilation solutions; shelter building; response to context e.g. Camouflage, self-protection, and self-cleaning; input/output/process cycling; waste management; etc.).

For the reason that the onus of the research lies on how to adapt to the issue of waste generation and waste management vis-à-vis finding alternatives to reducing reliance on raw natural materials for the construction of scenery for performances, the third level of organism feature analysis suited best. Interestingly, this research sought to experiment and suggest methods of adjusting to change, responding to climate change by recycling waste products, building a design whose cycle could last longer in its life time, and to create an environment (shelter) for a theatre performance.

Research into the bird as an organism, based on its relationship with its environment, revealed that human beings were not the only living entities dealing with the canker of waste. Materials used in building their shelter have changed from natural materials in the forms of leaves (fresh and dried), and tree branches to plastic waste. At the first glance, there were some similarities as well as disparities running through both situations in the

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employment of waste materials for the purpose of building shelter in the cases of nesting juxtaposed scenic design. First, the waste materials in both instances are not the original or first choice materials usually used in that venture. Second, this was an exercise of adaptation to the current problem on the ground – problem of waste. The tradeoffs are that, human beings are learning to adapt to a problem created by their own doing while the birds are innocent yet sharing in the consequences of human actions.

Again, left to them alone, the birds have an option of not using the plastic waste in their nesting but their usual materials have been engulfed by this plastic waste so much that the plastics have become an unavoidable material that they inculcate in the nesting. Human beings on the other hand have no other option than to deal with these plastic waste by employing them as resources for their activities.

Josué Corrales who researched into the consequences of the use of artificial nesting materials for birds for his Master's degree identifies some birds that use waste plastic for building their nests (see figure 4.1), not because that material is their first choice, but because human actions have compelled them into adapting to the situation of waste materials overpowering their original building materials. Examples of such birds are the male satin bowerbird, and the American coot (Corrales, 2016; Damian, n.d.; Esquivel et al., 2020)

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Figure 4.0.1. The American coot builds nest with layers of plastic waste. Image sourced from Birds Using Plastic for Nests, (2019): https://planetpatrol.co/blog/2019/06/25/birds-using-plastic-for-nests/

Although it is favourable for me that these birds use waste materials for nesting, their method of weaving the nests was quite challenging to emulate considering the fact that they only layered the materials one on top of the other without properly entangling them to form a bonded, whole structure, which is strong enough to withstand some external pressures. The option was then to search for the bird that still uses natural resources in its construction process, and that builds a rather resilient housing, which resulted in the choice of the red- headed quelea. Red-headed quelea birds are natives of the Sub-Saharan Africa region, "found within the forest zone in clearings where either rice is cultivated or grass has been established" (Grimes, 1977, p. 216).

Their nests appear to take the shape of a cocoon, having dome-like features where a small opening is left at the mouth of the nest to serve as entry and exit of the housing. Materials used in the quelea's nest

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construction consist of thin strips of typha torn which are detached lengthwise at the reeds (Esquivel et al., 2020; Grimes, 1977). An intriguing feature of this nest, as compared to the previous ones, is its close-fitting, tight-knitted nature (see figure 4.2), making it a good enough feature worthy of emulation for a structure that is required to exude strength and firmness in the face of handling and man- handling.

Figure 4.0.2. The red-headed quelea lodging in its completed clutch nest. Picture taken by UncleFai on March 8 2014: https://www.flickr.com/photos/64074416@N06/13011401995

The nest is constructed by passing the individual leaves through an overpass-and-underpass method suggestive of basket weaving, so that when observed from the side, the pattern resembled a series of gently intertwined "S's". Still, this weaving style did not conform to uniformity in terms of

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spacing and layering, but rather, the leaves are looped through holes arbitrarily spaced. Indicative of this weaving style, in comparison to basket weaving, is that aesthetics is an afterthought or an accidental feature while relevance is placed on durability.

Like the red-headed quelea which placed priority on function, the scenery that was to be designed was first and foremost to function as an appropriate environment and had to be sturdy, durable, as well as having the ability to be recycled again either for design purposes or otherwise. This meant also that, although in general terms, aesthetics is a major consideration in designing scenery for theatre performances, this was not the case in this instance. Priority was placed more on the conduciveness and appropriateness of the material to operate within the function of a stable environmental structure for a performance. Aesthetics was only considered an added value.

A number of attempts were made at capturing the flow of design in the nest. The initial instinct was to build a mould to cast the gentle 'S' which would give a proper representation of the bird's nest. Another design depicted an angular 'S' shape instead of the initial curved one. In designing the moulds I came to appreciate better the works of engineers as I deliberated on how to build a good mould that would make the blocks latch one onto another, firmly enough to prevent the structure from collapsing. Some of the sketches were outright impractical, hence the need to continue redesigning until the desired results are achieved, as has been revealed in the cyclical pattern of activities (CPA). The following images reveal the various sketching processes of the moulds.
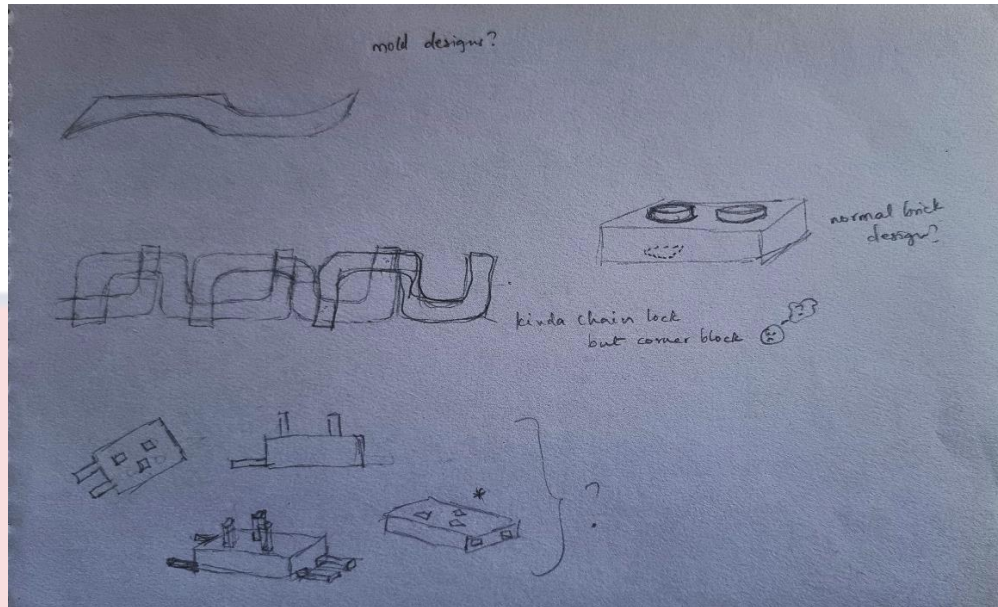
Figure 4.0.3. The first of all the sketches in which I attempt to duplicate the flow and movement of the strips for the 'nest'. Also in this sketch is a modification of the normal bricks used for building houses. Sketches by Mawukplorm H. Adjahoe, waste designing (202
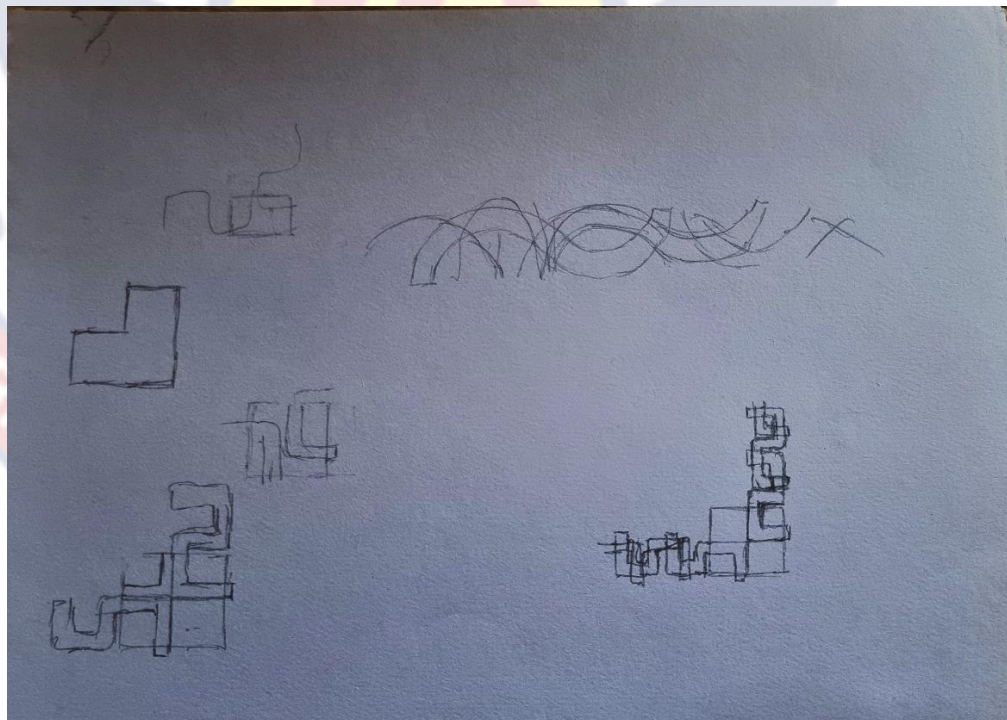
Figure 4.0.4. The curved outlook in the sketches are gradually transforming into an angular shape. Ideas of how to structure the corners of the design are sketched. Sketches by Mawukplorm H. Adjahoe, waste designing (2021)

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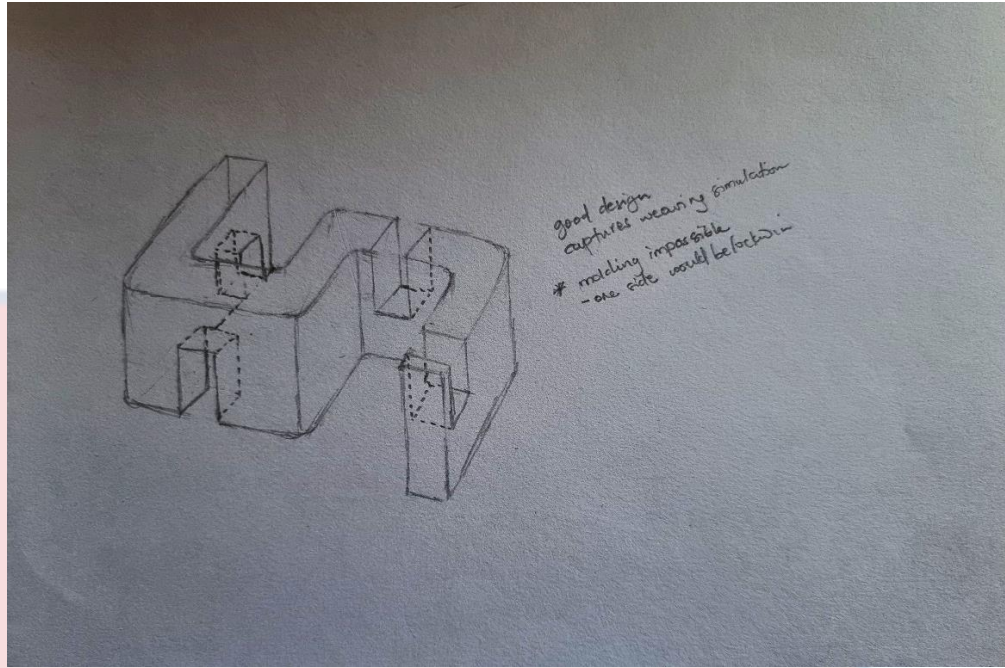
Figure 4.0.5. The mould design has taken shape, however, casting a complete 'S' as depicted in this proposed mould implies that one side of the 'S' cast will not disengage. Sketches by Mawukplorm H. Adjahoe, waste designing (2021)
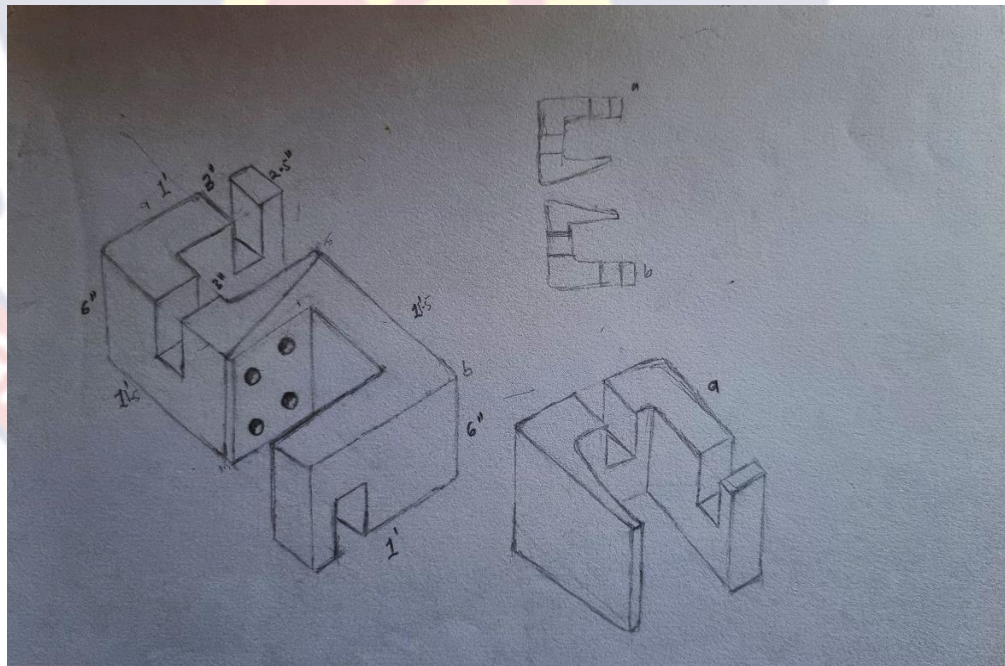
Figure 4.0.6. This sketch indicates an angular 'S' with the proposed mould divided into two, to be merged with screws or bolts and nuts through drilled holes in either sides of the conjoining diagonals of the cast. Sketches by Mawukplorm H. Adjahoe, waste designing

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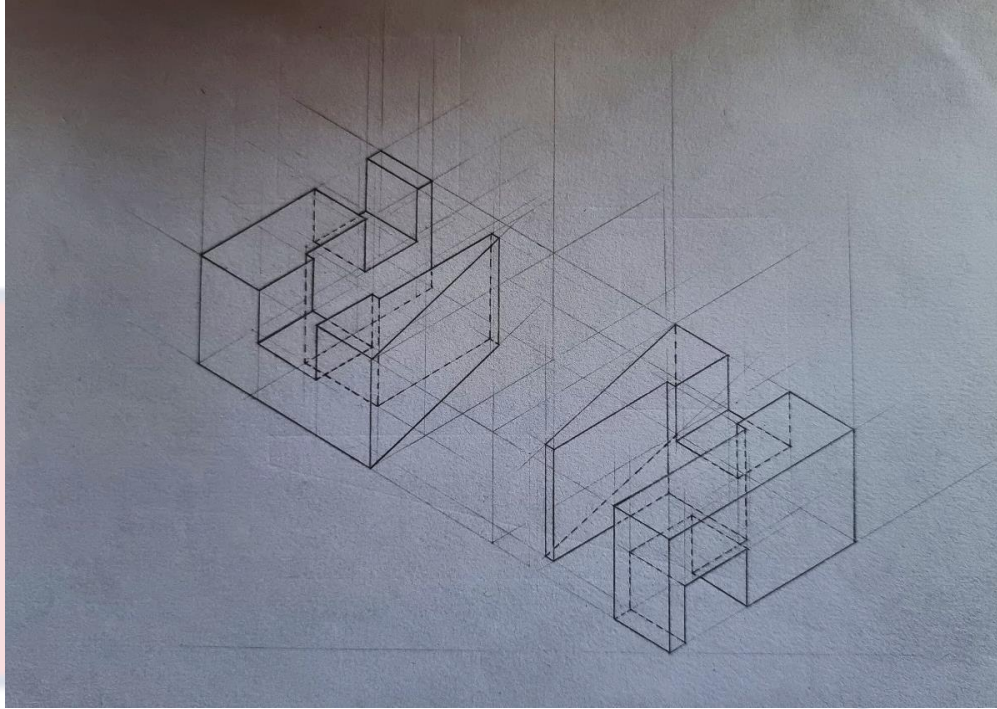
Figure 4.0.7. Image indicates the detailed mechanical drawing of the mould, with scale of 1'' to 1'. Sketches by Mawukplorm H. Adjahoe, waste designing (2021)

After the sketches were completed, a meeting was scheduled with a welder who specializes in production to critically deliberate on what is practical in the production of the moulds. Below are the pictures of the welded moulds.

Figure 4.0.8. Picture of moulds after they have gone through some levels of heat. Source: Mawukplorm H. Adjahoe, waste designing (2021)

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Figure 4.0.9. This image reveals a hollow mould and a solid mould. As a part of the experimentation process, the bottom of one of the moulds was removed to extricate the molten-plastic-sand cast. Source: Mawukplorm H. Adjahoe, waste designing (2021)

In making the blocks for construction, a number of plastic waste was selected, and were shredded into small squares using scissors and knife. There are essentially seven known grades of plastics comprising high-density polyethylene (HDPE) such as milk cartons, detergent bottles, cereal box liners, toys, buckets, park benches and rigid pipes; low-density polyethylene (LDPE), as plastic/cling wrap, sandwich and bread bags, bubble wrap, garbage bags, grocery bags and beverage cups; the commonly used polyethylene terephthalate (PET or PETE), examples include beverage bottles, food bottles/jars (salad dressing, peanut butter, honey, etc.) and polyester clothing or rope; Polyvinyl Chloride (PVC or Vinyl) which is considered as the most dangerous of all plastics, including plumbing pipes, credit cards, human and pet toys, rain gutters, teething rings, IV fluid bags and medical tubing and oxygen masks; Polypropylene (PP) such as straws, bottle caps, prescription bottles, hot food containers, packaging tape,

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disposable diapers and DVD/CD boxes; Polystyrene (PS or Styrofoam), examples include Cups, takeout food containers, shipping and product packaging, egg cartons, cutlery and building insulation; and other plastics as Eyeglasses, baby and sports bottles, electronics, CD/DVDs, lighting fixtures and clear plastic cutlery.

Kaolin was then mashed and applied to the inside of the moulds for easy removal of the cast. Shredding of the plastics was done to speed up the melting process in forming the 'S' block. The idea again, was to create a block that was compact on the outside, but loose on the inside for easy disintegration in case a different shape or form of a block is needed, signifying a high level of heat being applied to the top and bottom of the mould. Casting using this process failed as the shredded plastics did not compact well to form the block.

Three situations were plausible causes for this failure: first, that the plastics were all not of the same kind – it was a mixture of four main grades of plastic as LDPE, HDPE, PETE, and PS. Mostly the LDPEs were shredded because they may take longer time to melt and bond with the other grades. The second is that the particles of the shredded plastics were not fine enough to cause the particles to bond faster and stronger. And third, that the amount of heat applied was not powerful enough to cast the block even though the heat was regulated between 300℃ and 450℃ over an hour. The science behind the inability of the block to form was not investigated any further as that was not a major concern of this project.
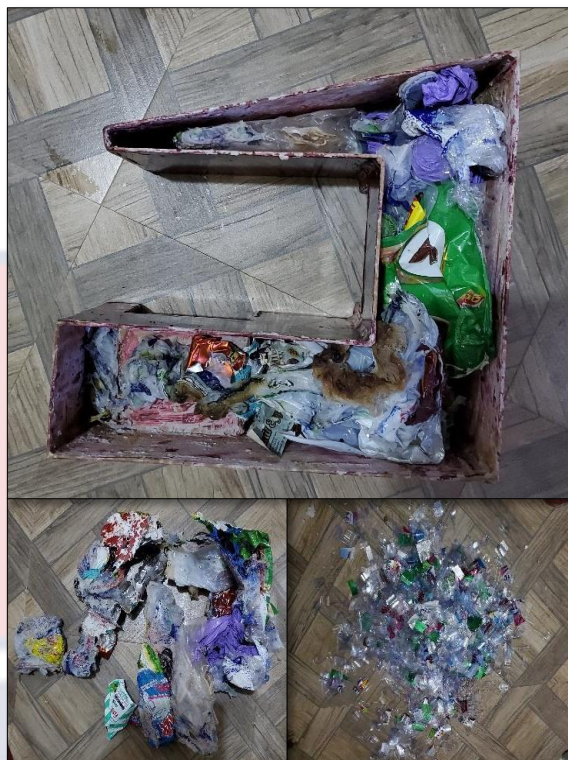
Figure 4.0.10. Testing the plastics by casting them into plastic blocks, using shredded HDPEs, and other grades of plastic in their original forms.

A second experiment to cast the block was to melt the plastics in a pan, mix with sand, and then compressed into the mould to form the block. There was no shredding involved in this process, however, with the lessons learned from the first testing process, soft plastics (of grades LDPE and PS, comprising of disposable cups and plates, grocery plastic bags, plastic spoons and forks, styrofoam, and food packaging) were used this time round, measuring 1.05 kg. Five kilograms of sand was poured into the molten plastic to cast the block. This process proved successful in the sense of creating the block. It nonetheless also had a number of shortcomings which brought its success into question.

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Figure 4.0.11. The process of creating the molten-plastic- sand block. This method was unfeasible considering the health hazards it posed coupled with the amount of time required to cast one block. Source: Mawukplorm H. Adjahoe, waste designing (2021)

In the first instance, the process of melting the plastic released poisonous gasses such as Dioxins, Furans, Mercury and Polychlorinated Biphenyls into the atmosphere thus polluting the air, the impact of which is climate change (Kanan & Samara, 2018; Verma et al., 2016). Verma et al., (2016, p. 701) assert that

> Dioxins settle on the crops and in our waterways where they eventually enter into our food and hence the body system. These Dioxins are the lethal persistent organic pollutants (POPs) and its worst component, […] commonly known as agent orange is a toxic compound which causes cancer and neurological damage, disrupts reproductive thyroid and respiratory systems.

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This comes as no surprise that during the stirring of the mixture, I briefly suffered suffocation from accidentally inhaling the smoke. Per the sustainability clause in this project, which overrides every stage, the integrity of this research is brought into disrepute with the use of this process. In the second instance, because the plastics are soft, a greater quantity would be needed for the melting process in creating the entire scenic structure, meaning that higher levels of gases would be emitted. Likewise, there would be the need for larger quantity of sand for the casting, after which disintegration would even prove difficult because of the kind of mixture made. Equally, this was unsustainable in terms of promoting recycling.

Figure 4.0.12. The result of experimenting with melting plastics mixed with sand to cast a block, which resulted in the removal of the bottom of the mould to be able to remove the block. Source: Mawukplorm H. Adjahoe (2021)

To have mimicked the building of a bird nest in the blocks for the design would have implied that the structure could be dismantled back into

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the single units of blocks, and be reassembled to form another structure or to make other designs which will be in conformity to the precepts of the CE theory. Closely comparable to this idea is the assemblage of the Lego toys. As discussed in the second chapter, one of the ideologies of CE theory is maintaining resource value within the system, which comes in the form of recycling and upcycling to create a close loop of resources. Indicative of this is the continuous use of the same waste materials used in building the scenery which would significantly reduce the need for 'new' materials, and will in turn reduce the cost of creating new scenery by maintaining the social and economic value of the waste materials for a long period of time. The moulding and casting process was therefore discontinued and shelved for another time.

A deeper understanding of the bird's nesting, beyond the simple structure, is the quality of material used in the construction. It was realized that the leaves were soft and malleable, easy to bend at whichever angle and in whichever direction. On the other hand, the waste materials being used to mimic this organism's structure were mostly hard and rigid. By this then, the thought came to use the soft plastics to weave the structure. After discussion with the project assistants, the disadvantage of this again was that time, as well as the appropriate soft plastics (such as grocery rubber, and food packaging) were at that moment, in limited quantity. The idea of mimicking a bird nest in its entirety was abandoned.

The failure of the venture in effect implied the need to embark on another biological solution search. There were two of the organisms left on the list for investigation, and principle extraction. With no particular

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preference, I selected the spider and for that matter, how it constructs it shelter which is the web. A fundamental research on the spider's web revealed an intriguing yet complex construction process for the many species of them that exists. Spiders range in size from .011 inch long – tiny Samoan moss spider, to the massive Goliath bird eater. This is a tarantula and has a leg span of almost a foot (Brunetta & Craig, 2010; Eberhard, 2020; Platnick, 2020; Rose, 2022).

It is well-known that all spiders produce silk, but not all spiders use the silk to spin webs. It is the silk that enables spiders to adapt to such a wide range of environments. Spiders have evolved many ways of using silk, including protection, detecting prey, and moving to new habitats. Among their uses are glues, watertight packaging, rappelling rope, and impact-absorbing snare netting (Brunetta & Craig, 2010; Eberhard, 2020; Platnick, 2020; Rose, 2022). It is actually possible for spiders to weave a variety of webs.

Depending on their needs, many will provide assistance in finding dinner and others will provide protection for their homes. It behoves on the spiders which web design will benefit them the most, and they choose accordingly. Research has it that there are over 45,000 known different species of spider in the entire world and some six basic identifiable spider webs as: the spiral orb web, sheet web, mesh web, triangle web, funnel web, and the cobweb (Brunetta & Craig, 2010; Eberhard, 2020; *Types of Spider Webs*, 2021).

Usually found in the forests and gardens, spiral orb webs are large,

circular webs that have a strong resemblance to wheels and are what most people associate with spider webs. The funnel webs are tucked in between plants and rocks and are flat, horizontal, with a tube resembling a funnel that leads to the spider's burrow. The design of the cobweb, unlike the previous designs, is heavily irregular. The strings of the cobwebs are jumbled and chaotic, explaining why this web is sometimes referred to as tangled webs. The cobwebs are the commonest of the spider webs easily located in corners, on ceilings, and windows (Z. David, 2022; *Types of Spider Webs*, 2021).

a

b

c
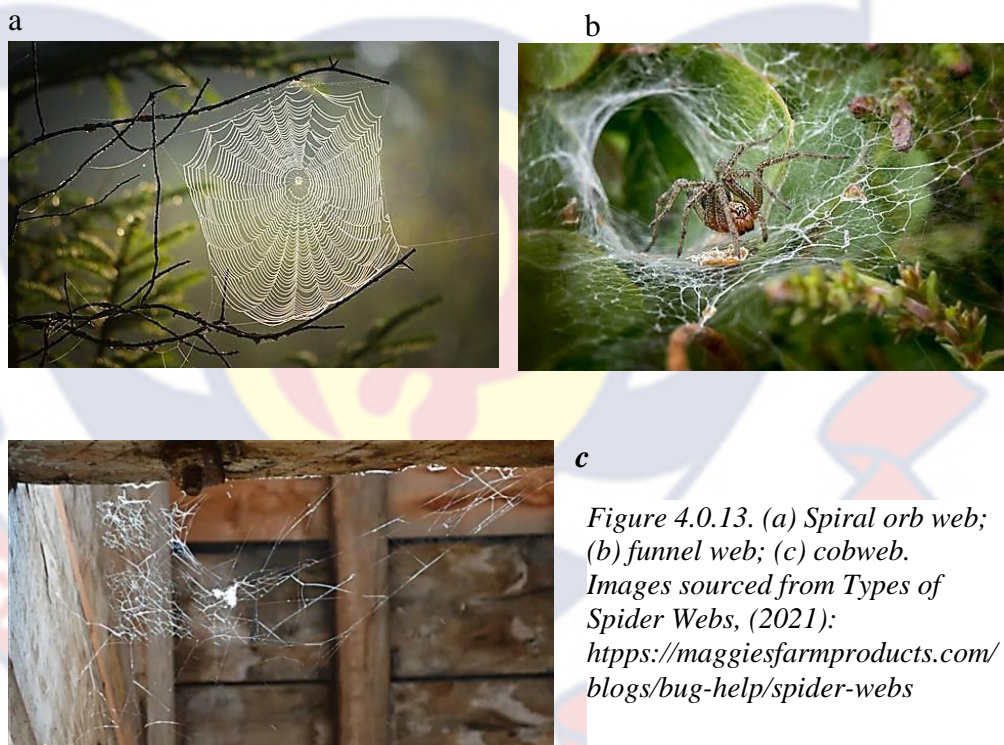
Figure 4.0.13. (a) Spiral orb web; (b) funnel web; (c) cobweb. Images sourced from Types of Spider Webs, (2021): htpps://maggiesfarmproducts.com/blogs/bug-help/spider-webs

Although less chaotic than the cobweb, the mesh webs exist in close description to the cobwebs. The difference between the two are that while cobwebs are found indoors, mesh webs are located outside our homes, and these mesh webs are anchored under leaves, among vegetation, and in fields.

The triangle web, as a 'sister' to the orb web, is best visualized as a slice of pizza. The triangle is formed by the connection of spokes and spirals to three silky strands. The web is covered in tiny fibres that produce a furry guise. Last but not least on the list is the sheet web. These are made up of thick layers of silk which stretch across blades of grass and branches. These webs mostly have a flat appearance. However, they also sometimes assume a dome or bowl-like appearance.

a   b

c

Figure 4.0.14. (a) Mesh or tangled web. Sourced from David (2022): htpps://beyondthetreat.com/types-of-spider-webs/

Of these six rudimentary types of spider webs as outlined above, the triangle web was selected simply because, the structure of the blocks for the scenery could be effortlessly visualized in the web pattern; and the web also presented with an easy-to-construct, easy-to-emulate character. The sketches for the projected materials were developed along the idea of the triangle web thus:

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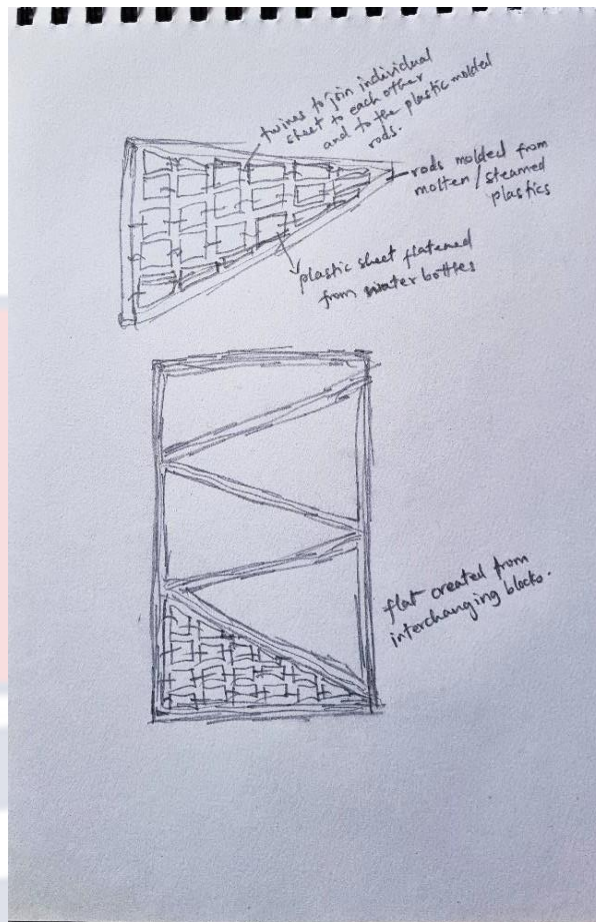
Figure 4.0.15. The sketch indicating the pizza-shaped plastic block. Plastics to be flattened out. Sketches by Mawukplorm H. Adjahoe, waste designing (2021)

Figure 4.15 presents a sketch of the pizza-shaped plastic block following the design of the triangle web. These blocks would be joined in a series of overlocking layers, with each layer facing the opposite direction finishing in the rectangular shape that usually defines the characteristic of a normal stage flat. The waste products suggested for the building of this object are evidently plastic of which some would be moulded to serve as the frame for the plastics to give the individual blocks some weight which would translate into a more durable flat, reinforced against the forces of wind and other natural elements.

Since it had been established that recycling soft plastics, in the manner described previously, would not auger well for this project and the

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environment at large, testing of the comparably harder materials began again, firstly, with cutting. The plan was to create a sheet-like plate by using cords to bind the materials at the edges in a method of spinning a web. This would be used to cover the frames that would be later prepared, also of plastic or glass. Bottles of similar make were grouped together and cut open. To produce a flat surface, the shoulder and the bottom of the bottles were cut off, leaving the body cylinder which is the middle part of the bottle – from the shoulder to the hip. The body cylinder was then cut open on the seam line and flattened out.

The water bottles are originally rounded shaped with rhythmic equidistant depressions producing an interesting cadence of water waves. While this texture was good on the eye in its original form, it was unfortunately not good on the plan that had been drawn. This was because flattening the bottles produced sharp uneven breaks in the depressions and still left curved ends. The most discouraging effect of building this kind of sheet was its incredibly light weight which meant that it could easily be swayed or in the worst case scenario be razed down should the performance be held outdoors. This idea was put on hold to experiment further with other strategies.
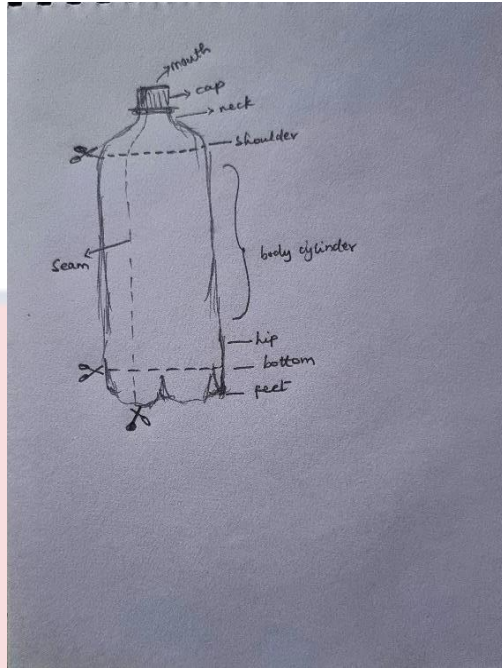
Figure 4.0.16. Indicated in this image is the parts of a bottle. The scissors and broken lines symbolize the areas that would be cut. Sketch by Mawukplorm H. Adjahoe: waste designing (2021)

Figure 4.0.17. The layout of the flattened bottles together with their removed parts. The body cylinders are flattened out but are not in themselves flat, and were light in weight. Source: Mawukplorm H. Adjahoe (2021)

While the idea of flattening did not work on the plastic bottles, it was relatively easy on the soft plastics. For uniformity and easy recycling, the plastic water sachets were chosen after the other types of plastics posed a difficulty during the testing. The soft plastic comprising of grocery bags, food packaging and plastic water sachets, were laid one on top of the other at the edges. A sheet of paper from an outdated calendar was placed on the intersections; and heat was applied to the area by way of ironing.

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The result of this test was that the grocery bags quickly melted and got stuck on the calendar. The sachet plastics however survived because evidently, they were harder than the grocery bags, becoming the obvious option for creating the sheets for covering the frames. The plastics were cut open on one side each of the horizontal and vertical seam lines, after which they were and air-dried in the studio. Cutting open the plastics doubled the sizes of the original rubber thereby reducing the resources, in terms of time and electricity, required to produce the sheets. Drying the open plastics also sped up the process of bonding as there was no presence of water to prevent the plastics from sticking to each other, indirectly saving again on time and energy.

Figure 4.0.18. This image indicates the packing of plastic sachets after its dryness was ascertained. Source: Mawukplorm H. Adjahoe, waste designing (2021)

The measurement of the water sachet sheets were conversely inconsistent because of different companies produced different sizes of the plastics. The measurement of the sheets ranged from as small as four feet by seven feet to as large as six feet by nine feet. These sheets were then textured by use of saw dust and glue to conceal the transparent nature of the

plastic water sachets.

Figure 4.0.19. Process of building the plastic sheet through the act of ironing series of plastic sachet which have been cut open and aired to produce a dry surface. Source: Mawukplorm H. Adjahoe (2021)

Still on the matter of testing out the grouped plastic bottles using the web spinning method, in a single unit water bottle, holes were perforated on the head of the cap and at the bottom of the bottle so that the cord could be passed through and knotted at each end for reinforcement. Figure 4.20 shows the sketch of the second look of the pizza-shaped blocks that would be used in constructing the flats. These blocks would be joined in a series of overlooking layers, with each layer facing the opposite direction finishing in the rectangular shape that usually defines the characteristic of a normal stage flat.

The waste products suggested for the building of this object are evidently plastic of which some would be moulded into rods to serve as the frame for the plastics to give the individual blocks some weight which would translate into a more durable flat, reinforced against the forces of wind and

other natural elements. The sketch is a later development on building the flat after the initial failed attempts of achieving a conducive structure.

Ten bottles in total were stack on each other to create a cylinder. When the perforated and threaded bottles were place on top of each other, the structure was loose and wobbly. The bottoms of all the bottles except the one at the base (i.e. bottle number 1 counting from the bottom upward) were then removed. With the complete bottle at the base of the cylinder, the bottles were then pushed one into the other and locked at the first depression to create a firm stack. While stacking the bottle on top of each other, the cord was passed through from the bottom perforation and knotted at the top of the cap of the last one, again for reinforcement. These plastic bottle cylinders I referred to as strings.
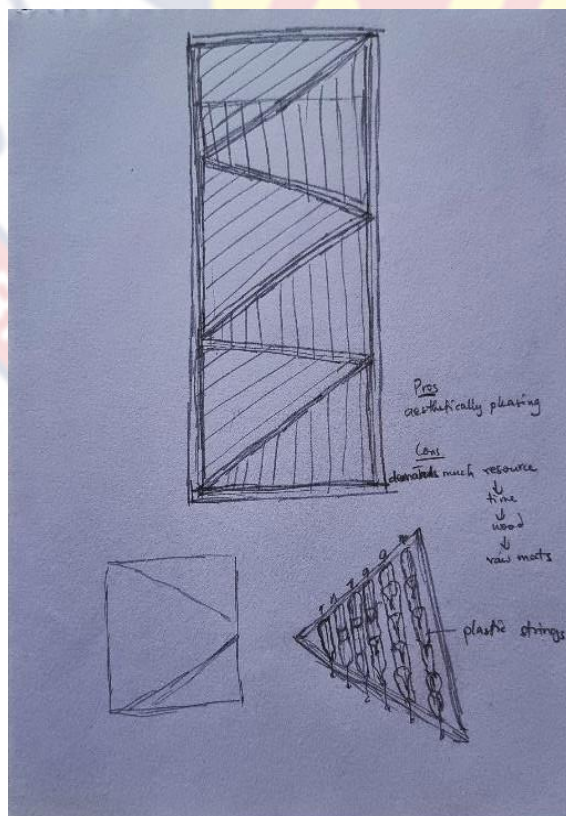
Figure 4.0.20. The design in this sketch presents a pizza-shaped plastic block in the form of the triangle web. Plastics maintain their original forms. Sketches by Mawukplorm H. Adjahoe: waste designing (2021)

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A total of sixteen strings, comprising of ten bottles each, were made to be attached to a frame of three feet by four feet, to produce a weightier structure. The total number of such stringed frames were sixty-five, out of which sixty-three frames were used in building twenty-one flats, implying that a flat was made up of three individual frames. The frames were so designed to be moulded following the method of casting the 'bird nest'. However, considering the fact that the initial testing of that method failed, coupled with the absence of the proper facility, and again with time limitations, I grudgingly resolved to use wood to build the frames.

The woods (which were basically African whitewood, mostly referred to in Ghana as wawa) came as flat boards measuring twelve feet in length and one foot in width, having the thickness of one inch – all measurements are approximations. In a regular wood scenic construction, mostly within the academic institutions in Ghana, this wawa board is split into strips measuring between three inches and four inches, and used in building the frames of a flat. For this project however, the boards were split into strips measuring two inches each, indicating an additional two strips to the usual four strips derived from each board.

These twelve-feet-high strips were then truncated to three feet rods, thereby generating four rods per each strip. The rods were nailed together to form a three-foot frame. Holes were bored into the frames through which the cords from the bottles were passed and tied. This method completed the process of my 'web spinning'. Talking of 'web spinning', an impression of the orb web was equally created using waste material to be supported by the

wood. The features of the orb web was mimicked by using a rug backing which was peeled from an old, unwanted rug. This structure was used by the main protagonist who happened to be a spider.

Figure 4.0.21. Images at the top left and right depict the preparation of the 'silk' for later spinning of the 'web' – the stringing process. The bottom image shows the spinning of the web by passing the cords through the drilled holes in the frames to be fastened by tying two separate cords through the drilled holes in the frames to be fastened by tying two separate cords into a knot. Source: Mawukplorm H. Adjahoe (2021)

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Figure 4.0.22. The final presentation of individual spun webs. Each frame contained sixteen strings woven into the frame, bringing the total measurement to 3' x 4'.

Figure 4.0.23. Image of the simulation of the spiral orb web (top left). Materials used as the silk was the rug backing. Image at the top left is the peeled off and fragmented rug backing, while the image below indicates the old rug with the backing already peeling off. Source: Mawukplorm H. Adjahoe (2021)

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The decision to split the wawa board into six strips was influenced by the core concept of the entire project, which is to create an entire scenery purely from waste. With the introduction of this raw material, that purpose, albeit partial, was defeated. Therefore to salvage the situation, the use of wood was reduced to the barest minimum where possible. From the various failures and limitations noted at every step of the testing and building process, it was concluded that perhaps designing solely with waste without the proper facilities in place, was a rather ambitious venture, although it was a necessary one to activate the conversation of environmental sustainability in the practice of scenic design and construction.

Inward and Outward Adjustment

As this project was exploratory and experimental, the assumption was that the methods could change, and changed it did. Of the two methods adopted for this study, the testing and application stages altered the arrangements of the planning and designing stages. While the biomimicry process was basically used for deriving the materials that are suitable and sustainable following nature's designs, the CPA was adopted for building the individual structures that would later be used in constructing the whole scenery.

In the first place, instead of a linear approach of the problem-based bio- mimicking, which was recommended by Helms, Vattam, and Goel (2006), the steps in the project testing and application culminated in a loop

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at the centre step of the approach, i.e. the biological solution search. As such, the structure of the final method depicted a horizontal '6' as seen in figure 4.15. For the reason that the initial principle to be applied did not function as planned, there was the need to revisit the drawing table to restart the planning process.

The final complete process only reiterates El-Zeiny (2012, p. 506) assertion that "the pattern of problem-based approach follows a progression of steps which, in practice, is non- linear and dynamic, in the sense that output from later stages frequently influences previous stages, providing iterative feedback and refinement loops". In the first attempt, the biological solution was found in the weaving of the bird nest. However, at the 'principle extraction' stage, a number of results were recorded which were rather unsustainable. Consequently, this particular biological solution had to be shelved, perhaps for another use in another project. Only after the second try in searching for the biological solution and successfully extracting its construction principle was I able to finally apply the principle extracted to the building of a scenery for a performance. In the end, the stages of mimicking in this project were identified as thus:
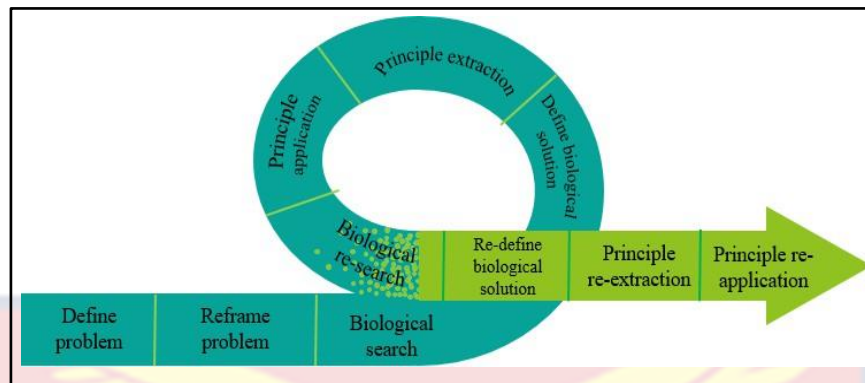
Figure 4.24. Looped steps of a problem based approach as applied to the project (biomimicry loop)

Furthermore, in the stages of designing, as generated by Cornock (1983) as the cyclical pattern of activities (CPA) for Fine Artists, the six stages changed in positions. While he had *generation* as the first stage in the pattern, *selection* became my first stage. I first had to decide and select which of the waste materials to try experimenting on or with. The selection stage was then followed by *generation* where the materials were manipulated to decide on what to use and how to use them. At this stage, I tried a couple of styles of spinning, texturing cutting, perforating, flattening, and pasting.

After generation, the next step was *synthesis*. I had to conceptualize and plan on what I wanted the building block to look like: whether they would be vertically propped or otherwise. This took me back to the selection and generation stages where I selected which method, and material was most conducive and appropriate for set designing, as well as for the sustainability theme. I selected what materials to use and for what design and model in order to form a resilient block for the scenic construction. It was at this stage that the actual stringing and sheets building began which

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involved the water bottles and the water sachet sheets. The softer water bottles (LDPE) were spun vertically while the harder plastics: the hard drinks bottles (HDPE) were spun horizontally being joined at the neck and bottom. This form of spinning was as result of the difficulty in cutting off their bottoms due to their hard nature.

An important observation was made however, that while attempting the first three stages, I had simultaneously tackled the remaining stages. It was noticed that the articulation, critical discussion and presentation stages run through every single step in the process. I therefore concluded that these were evaluative steps, and every design work attracts questions both internally and externally at every stage of the design process to ascertain its complementarity to the whole production concept.

Although these stages have been initially expressed as individual steps, during their application to this study, it was observed again that all the stages dovetailed into each other, creating a seemingly smooth overlap. At some points, there were no clear-cut indications of which step was being followed. This observation was made primarily during the first three stages: synthesis, generation, and selection. In following the procedures for the entire process of building the materials for the construction of the scenery, one thing was clear: that the CPA begun where the looped steps of bio-mimicking was ending. Dramatically speaking then, the dénouement of the biomimicry loop i.e. principle extraction, was the point of attack of the CPA to the process of extraction. After adopting the CPA for this study, its structure became thus:

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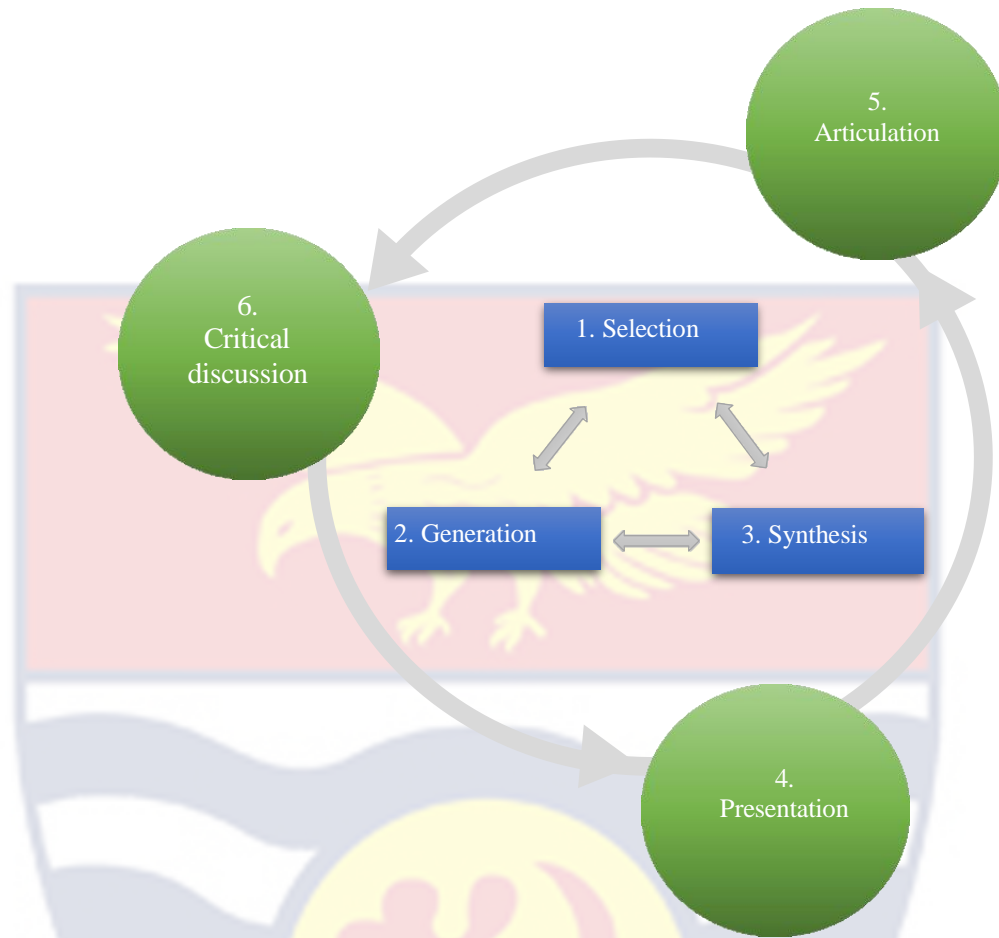
Figure 4.25. Final outlook of the cyclical pattern of activities as applied to this research. Source: Mawukplorm Harriet Adjahoe, designing with waste (2021)

The final appearance of the individual building blocks that were used in creating the flats for the scenic construction seemed a little far off from the appearance of the triangle web. Taking a glance at the creation, there is no visible link established between the original and the copied. Yet as Dickinson (1999, p. 2), would put it, "[…] sometimes it is not the actual morphology that endows a biological structure with its functional properties, but the intelligence with which it is used. Intelligence does not necessarily imply cognition; it may simply reflect the ability to use a structure in an efficient and flexible manner". This statement was an eye opener as well as

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my consolation. In the sense that the intelligence that was gathered from the spider spinning its web was the ability to create a structure that can be reused time and time again based on the spiders' recycling capabilities.

It is a fact that the spider recycles its web by chewing the old to produce a new web (Blackledge et al., 2009; Opell, 1998; Taylor & Foster, 1996). The capacity to recycle was captured in the structure of the individual frames as well as the whole flats. In the event that a designer desires a different form, height, or shape of the structure, the frames could be detached and arranged to serve whichever design. Similarly, the plastic strings could also be removed, repurposed, reshaped, and basically recycled into another form or design.

The idea was to come up with a creation that was sustainable in its indications as being modeled against nature. Although some challenges were faced during the process, the statement has been thus established that it is possible to apply some scientific methodologies to artistic creation process for sustainability purposes. In essence, this project has begun a process of creating a sustainable culture of scenic design for theatre performances.

Chapter Overview

This chapter covers the first part of the analysis in this thesis. Two major themes were at the centre of discussions here as recycling and the level of application of biomimicry. Under the first theme, analysis centred on what constitutes recycling particularly within the confines of the "R" in sustainable consumption and perhaps production. "R" in this sense

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represents a myriad of sustainability actions which include but are not limited to reusing, reducing, repurposing, recovering, redesigning, refurbishing, etc., all of which are acts or methods of recycling materials that are considered as waste.

It was established therefore that the concept of recycling transcends the mere physical material transformation to also assume social, and cultural tendencies which places waste materials within a value chain at a specific point in time. Perspectives from my position as the researcher, from players such as individuals, business owners, as well as arms of government, on the understanding and use of environmentally friendly procedures in our diurnal activities is equally captured under the theme of recycling as a sustainability tool. Discussions under the theme were regulated along the lines of the CE theory; its reflection on the data Vis á Vis the data's reflection on the theory of CE.

As the second theme of discussion, bio-mimicking or biomimicry both as a theory and as a sustainability concept was discussed in its provision as a design guide for the building of materials for the construction of scenery. Images corresponding to the levels of its applicability, successes and limitations, were provided to produce a visual understanding of the entire concept. Biomimicry has been discussed in this chapter as assuming some level of rigidity in its qualities and principles such that, achieving a hundred percent sustainable, in all sense, nature-emulated designs is but an illusion. Yet, it provides a pathway to return to studying nature in its capacity as a model, a mentor, and as a measure. For this purpose thus, although it is revealed through the analysis that mimicking nature for scenic

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design may prove some level of difficulty and pose a number of challenges, the fundamental essence of the exercise is the final intelligence that is derived from the natural organism, its evolution, and representation in the new creation.

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CHAPTER FIVE

SUSTAINABILITY IN, FOR, AND AS NEW PERFORMANCE CULTURES

Introduction

In the previous chapter, the analysis of data was based on what can be concluded as the building or generation of materials for construction. In this second part of the analysis, the focal point of the discussion indicates an evaluation of sustainability in its entirety of the methods employed as well as the results generated through the methods applied. Similar to identifying moments of sustainability, instances where methods produced unsustainable results are also discussed. Although the sustainability theory, which is the overarching theory in this thesis, reflects in all procedures and other theories, it bears the crux of the discussions in this chapter.

Elements as play performance – including preliminary activities that build up to the performance day; waste designing and construction juxtaposed with waste production during designing and construction; and the contribution to the Sustainable Development Goals. Sustainability as discussed here becomes the element of synthesis that totals the application of the other theories and concepts – as the CE theory and biomimicry – indicating their tangential and tributary characteristics. Again these discussions are complemented with visual items for clearer understanding. The title of this chapter was adopted from the framework of Dessein et al. (2015) which is entitled "Culture in, for and as sustainable development".

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Sustainability in, and, of Play Performance

"The overwhelming majority of theatrical productions begin with a script. This is not true, however, for every theatrical performance. The production of some plays begins with just an idea". So says the world renowned theatre pedagogue J. Michael Gillette (2013, p. 2), which holds true for this study. Starting off with the intention to build a scenery for a performance using waste materials as main resources, the selection of a play was a later consideration in the line-up of activities in the production process. In chapter three, I discussed the process of sampling the play texts before arriving at the final choice.

As the final criterion for choosing the play narrowed the options down to Ghanaian texts that followed the precepts of the traditional form of performance, only a number of prolific post-independence writers with few play texts were left standing. These include Martin Owusu – *The Story Ananse Told* (1971), and *The Legend of Aku Sika* (1999); Asiedu Yirenkyi – *Amma Praana* (1980); Yaw Asare – *Ananse in the Land of Idiots* (2006), and *Secrets of an Ancient Well* (Cir. 1997); and of course, Efua Theodora Sutherland, the one who initiated the whole movement of *Anasegoro* with *The Marriage of Anansewa* (1987). The choice thence became easy: to draw inspiration from the source i.e. Efua Theodora Sutherland.

Within the Ghanaian native performance tradition, the art of story-telling, or *anansesɛm* in *Twi*, *kodzi* in Fante, and *glitoto* in Ewe, is an oral tradition through which education on our cultural values, beliefs, religion, inter alia, were passed down from generation to generation. *Anansesɛm* is the

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generic name for many of the stories told to both young and old. *Ananse* is the Akan name for spider and *asƐm* could mean word or story. In this context therefore, *anansesƐm* implies stories about the spider or *Ananse* stories. However, there are other stories that do not have the spider as the protagonist, or even capture the spider at all, but are still considered as *anansesƐm*. *Ananse* is usually regarded as a trickster, greedy, cunning and witty man, sometimes and a conman who uses dubious means of surviving and existing. Of these, *anansesƐm* included fables, myths, legends, fairy tales, and others carved around particular misdemeanors which are used in correcting, and teaching lessons.

With the performance culture during the colonial and post-independence eras being dominated by European text, which strongly influenced post- independence writers, Efua Sutherland was concerned with producing a theatre that drew its strength and inspiration from the Ghanaian life. Hence her experimentation of the *Anansegoro*, which means *Ananse* plays (Addo, 2013; Djisenu, 2000; Mireku-Gyimah, 2018; Ukaegbu, 2010). By naming her research and experiment thus, she inculcates and documents, in an official manner, all the elements that constitute the general *agoro* (this has been discussed in the opening chapter). The main performance concept for this study was informed by the sustainability of the Ghanaian culture; in that the play, the setting, the costume, the production style, reflected Ghanaian life. On a technical level, the actions of the play are fixed to one location, implying that there are no scene changes. For an experiment of this nature, this makes the creation process easier and stress-free.

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Review of the play

The Marriage of Anansewa is divided into four acts. In the first act, Ananse describes his double-layered approach to solving his poverty crisis. Ananse therefore writes to four men (Chief of Sapaase, Chief of Mines, Togbe Klu, and Chief-Who-Is-Chief) who will be suitors for the hand of Ananse's daughter, Anansewa. His daughter is promised to each of them in exchange for gifts that will help him solve his financial difficulties. He organizes a most lively competition to determine which man will be the most loving and trustworthy husband for his daughter. In the second part, Ananse succeeds in his scheme to become rich.

The tension builds as the possibility looms that Chief-Who-Is-Chief will come and perform the final marriage ceremony and take Anansewa home. Tension continues to rise in the third part of the play as each of the remaining suitors confirms their intention to perform the marital rites. As a solution to the crisis, Ananse tells his daughter to pretend to be dead. During the final part of the play, and through the staged demise of Anansewa, the true intentions and level of commitment of the chiefs are revealed. Interestingly, Chief-Who-Is- Chief is the most suitable suitor, as he is also the most acceptable to Anansewa.

Not only is the play entertaining but also Sutherland makes use of traditional folktale conventions to reiterate the importance of upholding the tenets of a traditional Ghanaian marriage where young men and women maintain their dignity until they are lawfully married. In a rather fast-changing society that understands that once a woman receives gifts from a

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man, they are predisposed to co-habitation and making a family, even without actually lawfully marrying her, Sutherland's text comes as a reminder that it is never too late to return to the former good: *sankɔfa* – an Akan symbol which literally means "go back and get it". This is a pivotal commentary that the interaction between Akosua and Akwasi, which was a kind of play within a play, makes on the underscoring theme of the play.

It is a very common scene in modern Ghana to find students of the opposite sex cohabiting and living as married couples do. During casual conversations with some of the male students, they justify their philosophies that their partners have an obligation towards them by virtue of the fact that they gift them with clothing and accessories, and assist them with some pocket money to take care of themselves. But in the Ghanaian culture, there is no lawful marriage and no commitments until the appropriate rites have been performed. Akosua then explicitly states to Akwasi that she does not owe him anything until he visits her parents to present the head drink (pp. 17-19). As well, Anansewa owes no responsibility to the four chiefs. In view of this, Ananse is exonerated of the charge of criminal behavior. This is because he manipulated information in order to obtain gifts from suitors, which are not strictly forbidden by custom.

Making a sustainable choice: the adapted versus the original

After deciding on *The Marriage of Anansewa*, I remembered a colleague of mine, whose master's project was to re-interpret the play into a musical. Although Efua Sutherland's play captures the presence of the

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mboguo (Ghanaian traditional equivalence of the Greek chorus), the music component is missing the published text, leaving performers to either skip that part or recompose some songs to suit the context. Since staging that project on 29th November, 2015, at the ETS Studio, University of Ghana, it has been domiciled on the shelves, gathering dust, which has been the unfortunate practice for most years that I have been a theatre practitioner. Student playwrights in most institutions never have their plays see the light of day. In the best case scenarios the plays are experienced at a one-time play-reading, then they are packed back to the shelves, waiting to be the foundation upon which a pile of future unperformed plays are compounded, and only to be discarded in the later years.

For the purpose that, in performing this new creation, I was promoting the sustenance of the play and propagating the efforts of the writer, I concluded on this adaptation in favour of the original which has been performed severally over the years, and even experienced international stages and gained international recognition. Another reason for this choice was its feature that fit my ideology for the production: the hybridization ideology. The musical version of Sutherland's play presented a beautiful blend of contemporary music with traditional acts. Culture is not stagnant. Once there is an interaction with a foreign culture, there is bound to be an exchange be it minute or grand. Similarly, cultures change with each successive generation based on a number of factors, to suit their wants and taste. In this light, Sam (2016) writes of his project thus:

> […] musical compositions characterised by traditional
>
> rhythms and idioms from Ghanaian communities,

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hybridised with some foreign musical influences, predominantly the Fante rhythms: Apatampa, Fante Adzewa. Ompe, and Sikyi, due to the socio-cultural background of the play, promotes the musical culture of the community. […] The cultural fundamental of this project, is the use of traditional and popular musical idioms to re-interpret drama. A presentation of culture in a new direction (pp. 117, 118).

Dwelling on this notion of creating new pathways of performance in Ghana that present a culturally diversified yet sustainable front, I embarked on a journey that would culminate in hybrid theatre experience which would excite both the young and old while inciting them into actions of environmental sustainability. This ideology would eventually become the production concept which would circumnavigate the creative interpretation of the script, unifying the artistic vision of producer, director, and designers: a blend of nature and man-made – realism and expressionism.

The Production Style

As an artistic expression, realism is defined as the accurate detailed, unembellished depiction of nature or contemporary life; while expressionism seeks to depict emotions and responses that objects and events arouse within a person (Brockett, 1982; Gillette, 2013; Kaoiṁe,

2002; Patterson, 2015; Styan, 1981). In effect, expressionism is a subjective representation of inner experiences whereas realism is a concern for facts or objective expressions of life. Drama performance in the pre-independence era occurred in semi-natural spaces which could on some level be equated to modern theatre rudimentary specifications.

The courtyards usually served as the theatre building for the performance; the stage and scenery equivalent is the comfort and shade provided by the big old tree in the middle of the compound with the complement of other trees – ornamental or edible; lighting is derived from the natural moonlight; the natural fresh evening breeze provided the air-conditioning; and the crickets, players and narrator were responsible for the sound creation to boost the ambience of the performance. This imagery was the reality of the cultural existence of Ghanaians, and portrayed a comparatively more sustainable and environmentally friendly practice. Dissimilar to the modern day theatre practice, the indigenous story-telling art form rejected any form of wall between the performers and audiences. Therefore, every participant in the art was considered a player.

The first step to emulating this artistic style was to identify an appropriate space that had the capacity to accommodate the determined concept without any interference, outside of the Main Auditorium, University of Cape Coast. Space is an important notion in this project for its capability to amalgamate every creative element in a holistic presentation and representation of a more sustainable theatre practice. After the search, two spaces showed great potential – the congregation ground, and the lawn behind the Faculty of Social Sciences building.

Although both prospective venues had ample greenery to fulfill the reality of the performance culture, I decided on the Congregation Ground because of two reasons: its size would afford me the opportunity to explore my creative imagination; and it could evidently accommodate more players and audience. The Congregation Ground could be demarcated into two unique areas – one area is a clear, evened space that has a sheltered platform while the other area is rutted, gently sloped, and covered by trees irregularly spaced providing shade all round as well as a constant flow of fresh breeze.

Figure 5.0.1. Potential performance space 1: the lawn area behind the Faculty of Social Sciences building, U.C.C

Figure 5.0.2. Potential performance space 2: the Congregation Ground area with sheltered platform

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Figure 5.0.3. Potential performance space 3: Congregation Ground area with trees

On a realistic level, the structure of the performance area for the traditional story-telling was mostly a large open space bounded by walls that were interspersed between buildings. These encased spaces imaged forms and shapes that ranged from rectangles to circles and anything in between depending on the number and positions of individual houses that made up the structure, through the connection of the walls. These structures were commonly referred to as family houses because then, extended families lived on one compound where one could find grandparents, parents, children, aunties, uncles, cousins, nieces, and nephews habiting one space albeit having their individual blocks.

To ably portray this set-up, the apparent option had to be the Congregation Ground which had enough trees for shade and space to explore my creative imagination. Although the aim was to depict a real-life culture, the fact was also that the artistic creation was only a representation of the real life and not real life itself, for which reason, participants of the production had to be sheltered from instances of rain should it occur. Concern for participants was not limited to the production night alone but also reflected in the preparatory stages: the rehearsal period.

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Rehearsing for sustainability

Except for the unplanned improvisational theatre which requires little to no rehearsals (Hauck, 2012), the general concept of rehearsal is an important aspect of theatre productions. Theatrical rehearsal has its purpose entrenched in a preparatory mechanism through which the meaning and importance of play texts are discovered and displayed to audiences. Rehearsal usually begins after the audition and production meeting. Nonetheless, due to public engagements, including school attendance being brought to a standstill with the spread of the Coronavirus, we had a close audition, where the Director, Stephen Koomson, together with the Stage Manager, Ann-Marie Ahene-Affoh, and myself selected individuals to play certain roles based on their outputs in previous productions.

At the time of the auditions, only first year undergraduate students were on campus to complete their academic year, leaving no other option than to work with what was available at the time. Fortunately for me, the Director of the production taught one of their courses, and agreed to use their participation in the production as part of their grading. This strategy was used to encourage them to remain committed to the project.

Being constrained with time, we quickly began work on January 20th, 2021 with a crash programme – production meeting, play reading, and developing characterisations for the various personalities in the play. Prior to that we held a brief meeting on the evening of September 24th, 2020, with the main aim of enlightening the selected production crew on the project, its purpose and relevance thereof; and to begin building a relationship through

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introductions and casual conversations.

Since the students were preparing for recess at that time, they were given the play texts to study over the course of the break. The director took a total of three weeks to complete the blocking of the first two acts, during which time, I was liaising with the creator of the musical, John E. Sam, to acquire the songs in audio format. Attempts to bring in the creator on some of the rehearsal days to assist in teaching the songs correctly failed as his schedule could not permit him to, coupled with the brief ban on traveling. The first music rehearsal with him was via video call which due to unstable internet connectivity, ended rather prematurely. With my little background in music, I decided to learn the songs to teach the remaining cast.

Although the cast, up to that point, showed great potential and took the exercise seriously, the distress however was that majority of them had very little training in music and dance. In addition, a surprising discovery made was that the lead actor, playing the role of Ananse, was tone-deaf. We were yet not willing to change him because that notwithstanding, he splendidly delivered in his role. As a way of proving my commitment to the production, and to training good performers, I accepted the challenge and scheduled an hour of rehearsal with him daily while encouraging him to be constantly listening to the songs.

It did thankfully pay off in the end. Edmundson Sam managed to attend one of the rehearsals five weeks short of the performance day, to polish the songs that had been learned and to make corrections where possible and necessary. Out of the thirty-three music compositions, we

learned twenty-seven because some of them were pretty technical, and the players found some difficult to learn.

Still advancing in the outlook of hybridization, I arranged with the Oguaa Suapon Band which is the resident music band of the Department of Music and Dance, University of Cape Coast, to play the accompaniments to the songs. There were no musical instruments employed in the performance of the local art, with the closest element of instrumentation being the clapping of hands and perhaps drumming on the sides of the stools.

Throughout the first production of the new musical, the audio of the recorded songs were played through speakers to support the voices in the live performance. This element of audio play-back took away some essence of 'liveness' in the entire production – an important characterization of original art form. In the attempt at a holistic emulation therefore, I decided on using the live band for the music accompaniment which would be a combination of foreign and indigenous instruments; two lead guitars, a bass guitar, djembe, and the *apentemma* (a drum used in the *adowa* ensemble).

I was particular about the music, the dance, and the actions, being a motor for cultural communication because that formed the core essence of the performance structure for the waste designing project – cultural sustainability. By week six, the number of consistent players dwindled due to the clashes in their class schedules for which reason we reopened auditions to include even non-theatre students. The turn-out was surprisingly impressive and we got more than we expected. Subsequent rehearsal days comprised of learning music, movements, and general directing. Dance

movements were choreographed movements to reflect the ethno-cultural definition of the play. The choreographers were Jason Otoo and his dance group – the Odikro Royals, who likewise joined in the performance to add an element of professionalism to a rather amateurish dance display by the actors.

A total of thirteen weeks were spent preparing for one night of performance. Band rehearsals began late into the rehearsal itinerary because the bandsmen were on leave at different periods in time, thereby posing a difficulty in getting a full house for a successful preparation. The band only started rehearsing with the cast a week before the performance day. On 27th March, 2021, an excerpt of the play was presented during one of the colloquia of an international gathering of theatre practitioners on the celebration of the World Theatre Day. The event was held virtually for the obvious reason of the Corona virus and its associated restrictions.

Figure 5.4. In the picture are the cast and crew, after the performance of the excerpt for the celebration of the World Theatre Day, March 2021. Source: Marilyn Parker-Longdon (27th March, 2021).

During the times of rehearsal, the welfare of the entire production

team was catered for. As much as possible, rehearsal venues were limited to enclosed spaces such as the Main Auditorium, the Naana Jane Opoku Agyemang Auditorium, and the foyer of the Ammisah Arthur Language Centre, p attacks. At these auditoria, there was no use of air-conditioners in humid weather conditions. When it was necessary to use fans, limit was applied only to the area occupied by the team. This follows the call in *green theatre* to save on the energy consumption of these seemingly highly consuming electrical appliances.

In the guiding document of London's theatre industry, the data provided on the contribution of electricity consumption to total carbon footprint is twenty-eight percent (28%) for rehearsal space (cooling/heating), and thirty- five percent (35%) for theatre front of house (daytime and evening, including auditorium air-conditioning/ cooling). While there is no data on the carbon footprint of the Ghanaian theatre industry, experience of over a decade as a student and later as a practitioner of theatre reveals that electricity consumption does contribute a lot to total carbon emissions as we run six to eight hours of rehearsal in air-conditioned halls. The decision to cut down on the usage of this electrical appliance may have equally cut down on the total carbon emission to save the ecology.

After refreshments, the plastic wastes were separated, collected and sent to the studio to add to the pile of waste going through recycling for the scenery. Through this exemplary practice, I encouraged the players to practice segregation of waste to promote easy recycling of waste products. During one of our interactions, they admitted to the non-segregation of their waste products because of the absence of separate dustbins for recyclable

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products, thereby consolidating the concerns of the workers at the restaurants and resorts. They again confirmed that the dump truck operators cared less about segregating waste and only heaped everything together. Nonetheless, I appealed to them to segregate their waste for the purposes of the waste designing project.

Typical of any resultant successful theatre production is the general rehearsal: taking directions, blocking movements, and the technical rehearsal: lighting, costume, sound, props, and scenery which could be in various levels and intensities depending on the complexities in the technical outfits. This project, however, did not follow this procedure for the reason that the rehearsal component of the project had already changed the interface of the local art, in that the indigenous performance featured no rehearsals; some of the stories told were created at the spur of the moment. But then again, this was a process of a hybrid creation which allowed me the chance to explore and improvise in situations where necessary.

To this effect, a mini costume parade was held to ascertain its conduciveness; lighting was placed on stand-by in the hope that together with the moonlight, the street light would be sufficient; lapel microphones were also placed on stand-by to be used in the event that the wind carried our voices in the opposite direction. To operate these systems or not were dependent on the outcome of the final day of rehearsal. After the final day of rehearsal, it was determined that the production would require the use of all these systems to support a richer audio-visual representation of this hybrid theatre creation.

Project Presentation

On 16ᵗʰ April, 2021, the play was performed at the Congregation Ground, University of Cape Coast. It opened with a projection of images and videos of the waste designing process at 6.00 pm, and this lasted for thirty minutes. This was to serve as an introduction to and communication of the purpose of the production. The show was free of charge and attracted a large size audience; larger than the courtyard could contain. The number of audiences who did not join in time could only peek from yards away from the entrance to the courtyard. Although I admonished audience members to wear their nose masks, and keep a safe distance from each other, I lost the control when the space was overfilled.

The body lapel microphones worked fine with the exception of Anasewa's microphone which had an erratic connection with the receiver. This compelled her to shout in some instances so that the growing audience could hear her. The band and mboguo or chorus were seated among the audience to establish the no-fourth-wall principle which characterises story-telling. Once a player was not within Ananse's walls engaged in dialogues, they were among the audience doubling as an *mboguo*.

Similarly, the entry and exit into the playing space was from among the audience/ players. Through their emotional responses, the sighs, and the laughter, we discerned that the audience felt a part of the production. Equally evident of this perception was when during one of the scenes Ananse sang about his disposition when he becomes rich, the audience hopped onto the playing area joining in the singing and dancing. By this act, the breaking

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of the fourth wall was achieved as the audience identified with the players.

Because the band did not have sufficient rehearsal, they ended up improvising for a number of songs, sometimes making the songs sound a little off-key. Notwithstanding the few hitches, the players covered up skilfully, and the narrator related very well with all her players, and at a point made reference to the waste designed house. This provoked people's thoughts on the myriad of innovations that could be achieved through recycling. Lighting the performance was easy because it required no special lighting effects; the display of culture was also reflected through the costumes, make-up, props, as well as sound.

Figure 5.5. Highlights of the performance night. Pictures taken by Bismark Ofori (16th April, 2021) for Mawukplorm H. Adjahoe: waste designing (2021)

I only learned at the end of the performance that audiences were attracted to join in the experience after having encountered the scenery designed, confirming the commencement of a journey of creating sustainable theatre performances. I had the opportunity of sharing the details

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of the project with the audience members who approached me after the performance had ended. In the end it was not simply about witnessing a play, but sharing in the experiences of Kwaku Ananse, and learning beyond the lessons he learned.

Waste Designing for The Marriage of Anansewa

The processes applied to creating the materials for the scenery construction has been discussed at length in previous chapters. Under this topic, I will discuss the conceptualization of the design for the scenery itself, while situating it within the sustainability parameters of how it conforms to the theories adopted or otherwise. Mention has also been made of the use of the design process in creating and building the appropriate environment for this project. I will again analyze how the process played out in arriving at the final design, and what changes occurred at what times.

Although there could be more, the standard stages for designing any technical theatre have been outlined as: commitment, analysis, research, incubation, selection, implementation, and evaluation. Deductive of the many analysis done so far, the commitment stage did not only apply to conceiving the design, but also to the inception of the entire project – from its conception stage to its implementation and evaluation stages. The nature of the project rightly informed the choice of play and the subsequent theatrical elements. Staying committed to the course of waste designing is what culminated into the creation of the hybrid theatre experience.

Commitment equally applied to seeing through the application of the

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various theories, regardless of the many levels of their difficulty and challenges during and after the testing periods. In the instance of the CE theory, there was the commitment to establishing a creative economy that thrived on zero waste and pollution, or in the least, an artistic economy that produces a negligible amount of waste and pollution.

The commitment to this environmentalist principle was what informed the choice of rehearsal, and performance venues; the building a relationship between the performers and the environment through the reiteration of environmental-friendly actions; as well as the modus operandi of the entire material selection and building process. This is in approval of what Gillette (2013), explains that "Commitment is probably the most important step in the whole design process. If you wholeheartedly commit your energies to an assignment, you are promising yourself that you will do the best work you can possibly do" (p. 22).

After reaffirming my utmost commitment to the production, I started analysing the play text. According to Gillette (2013, p. 23), this step in the design process has two main objectives. The first is "gathering information that will help clarify and refine the definition of the challenge you are facing"; and the second is "identifying areas that will require further research". Primary sources of information were through reading the play text, and through meetings and discussions with the production design team. My journey as the scenic designer for this project was embedded in sketches. At each stage of the design process, where necessary, I articulated my thought through drawings.

Ideally, it is required of a technical designer to read the play a couple of times to derive the information that will refine the design challenge. In the case of this production, this was a well-known play text that I have had the opportunity to perform in and also witness as an audience, implying that I knew the play a little too well. I therefore did not spend much time reading the script over and over again, as I already had the information that I needed. I rather carried a notebook on me in which I jotted every idea that came to mind, inconsequential as it may seem at that time, while sometimes making thumbnail sketches to visualize the thought in my head.

Gillette (2013), again asserts that the meetings with the production design team are meant to discuss production concepts, and when necessary, make amendments to the concept to enhance its operability on all levels of theatrical technicalities. For the reason that the concept for the production was preconceived even before the inception of the play production process – which usually begins with play selection – the meetings with the production design team was to firm up elements that would work towards the realization of the concept.

The analysis and research phases for this project were thus merged into a single step since the analysis was dependent on the result of the research, and vice versa. The main research concern followed the line of the ability to blend tradition with contemporary in producing a composite art form which still manifested distinctive elements. From a historical perspective, the play is set in postcolonial Ghana which already indicates an infiltration of modernity into tradition. Due to inadequate facilities and skills, the ability to mould blocks (which would have made it easier to

simulate postcolonial housing) was severely compromised. The alternative was to use the newly developed material model as a means to represent historical aspects of the setting in accordance with the principles of realism. There was also the need to functionalize the set by accurately indicating the socio-economic stance; usage of doors and windows, if any; and the supplementary positioning of set props, if any.

Following the initial production interaction, it was deduced that the environmentalist concept of designing with waste which extends to equally encapsulate the cultural, social, and economic rudiments of sustainability would not be so much of a challenge once the right mechanisms were in place. Mechanisms in this context, in general terms implied resources including but not limited to spaces, labour, tools, materials, skills, and time. We were able to realize some of the resources such as skill, labour, spaces, and materials. In the same vein, there were some mechanisms that we did not have much control over such as time and tools. The take-home lesson of the entire production process was that we made things work through a series of improvisations, regardless of the deficiencies presented, to ensure some level of sustainability in all the production phases.

In the fourth phase of the design process as incubation, I allowed the ideas that had been generated over the period to hatch by concentrating on other matters. I leveraged on the two weeks for the SDG-Graduate School workshop held in March, 2021, to incubate the ideas conceived. The SDG-Graduate School organized two-week workshops for its beneficiaries every semester during which students attend series of seminars, and workshops and made presentations based on their research works.

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While I could not entirely avoid thinking about the design work every now and then, I concentrated my efforts on gathering more waste objects for the material construction. Some of the plastic bottles used in the material construction were gathered from these two weeks of intense scholarly activities.

Equipped with prior information concerning the historical and conceptual ideas of the play, coupled with research on previous productions of the play, I set off on the selection phase of the design process. The chronological arrangement of the processes however (as seen in Gillette, 2013), presents the selection step subsequent to the incubation step. In the selection phase a designer sifts through the data accumulated to produce series of visual representations in form of sketches and renderings (Gillette, 2013). A number of thumbnail sketches were produced in reflection of how the information was being processed.

The thumbnail sketches in figure 5.6 characterize the few ideas that were generated during the interaction with the play and the production concept. At the time of producing these sketches, the plan of imitating the bird nest was in process of being tested. The sketches were thus drafted bearing in mind that the scenic structure would be developed using cast blocks. Evident in the sketch is also another form of design inspiration from the spider web – in this instance the outline of the spiral orb web – to create the enclosed space which would serve as a simulation of a traditional courthouse.

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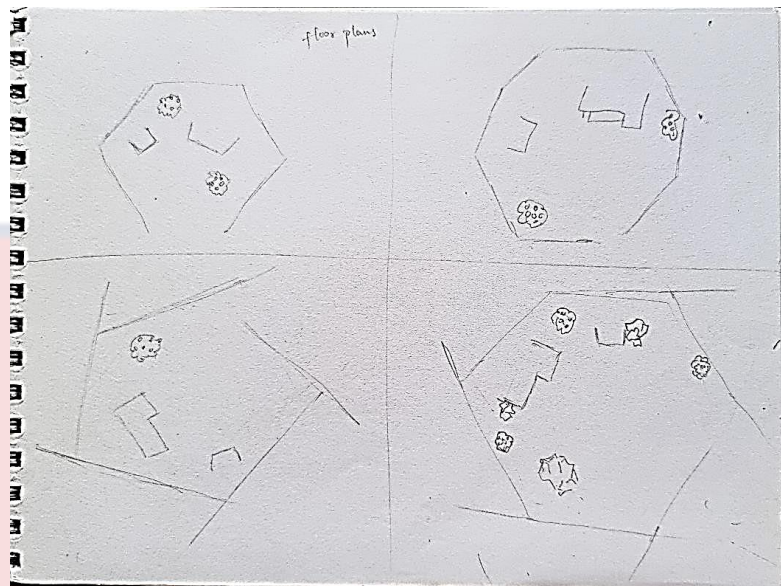
Figure 5.6. Thumbnail sketches of ground plans of the performance space. Sketches by Mawukplorm H. Adjahoe (2021)

El-Zeiny (2012), in his review of the application of biomimicry in interior architecture, has criticized this form of mimicry as shallow considering that for a design to qualify as biomimetic, there has to be an element of biology. He credits Vincent et al., (2005) with the claim that a bio-inspired design should go beyond looks to reflect nature's science. Yet in the same breath, El-Zeiny states that "[…] perhaps the key to understanding the role of biomimicry in interior architecture is the fact that the reason for the success of any design is not that it can trace its roots back to a natural principle but that it is an example of good design!" (2012, p. 503). This is in clear affirmation of Dickinson's understanding of the principle of extraction of intelligence in matters biomimicry, which has been discussed in the previous chapter.

The sketches of the ground plan were generated following the depiction of Ananse and his dealings with other players. The ground plan

shrewdly suggests how every individual who would interact with Ananse would be trapped in his web of braininess, ambition, jocularity, and wit, in a bid to make his living better than it is. It is comparable to the smartness of the spider whose webs are mostly invisible under certain conditions that they prey on the unlucky animals that are unfortunately entrapped in the webs, to be objects of feasting and fattening for the spiders.

Following the selection phase, I then went onto the brooding phase. The period of incubation is important to allow the "subconscious mind mull over the data that you have absorbed" (Gillette, 2013, p. 28), in order to produce more quality work. Prior to the incubation phase, my thoughts circled around designing a storey structure; and positioning the set in a way to have a number of trees featuring within the performance space, in close representation of the natural setting that characterized the story-telling space.

After allowing my subconscious to process the information that I had gathered from the previous steps, I was able to plan the designs more efficiently pass the assumed aesthetic component to consider perspectives from the audience/ players seating, and the other technical implications, such as lighting. I was continuously in a 'questioning' mode even at the selection phase. This was attributed to the fact that the entire exercise was typified by experimentations and explorations, for which reason it was important to constantly reference previous ideas generated in order to create a more satisfactory product.

The designs that were sketched post-incubation had been greatly

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modified and had almost no semblance to the previous thumbnail sketches that were produced during the selection phase, as is evident from the sketches in figure 5.7. I consider this phase as a revisit to the selection phase: 'selection phase round two'. At this stage, the copying process had failed to produce a positive result, and indicated a major challenge, which forced a complete revision of the previous approach.
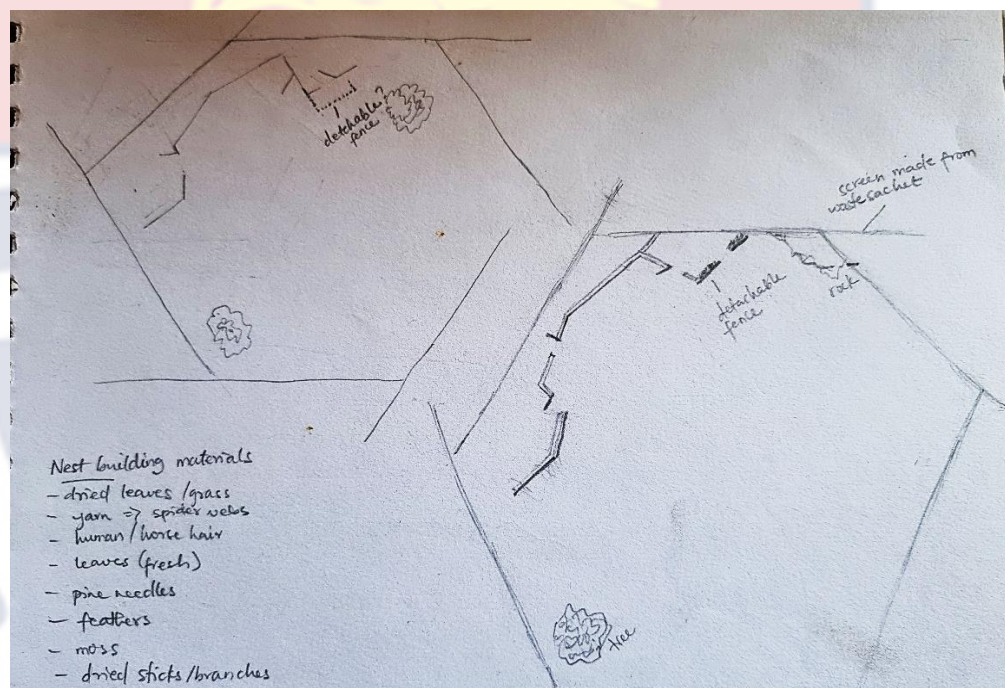
Figure 5.7. The new sketches drawn after considering the limitations of the previous designs as well the challenges in the material construction process. These sketches were only projections of what the setup would look like. The actual finished worked was a little different from the sketch particularly in the case of the position and number of trees. Sketches made by Mawukplorm H. Adjahoe (2021)

While the outline of the performance space maintained its spider-web- imitated appearance, the structural elements located within the enclosed space were reduced both in number and size. A single structure remained standing and was transformed from a box, outside of which the

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actions occurred, into the interior layout of the house of Ananse. No clear demarcation of acting space was established in reference to the story-telling spatial principle. In effect, all players found within the space were considered to be both in the courtyard as well as inside the living room of Kweku Ananse.

It is evident in figure 5.8 (as seen below) that the design of the inner courts of the performance has begun to take shape as the sketch captures the details of the appearance of the structure. In a realistic sense, post-colonial houses are rectangular in shape, while some rooms may assume a square shape. Nevertheless, I chose an obscure half-octagon as a way to express the results of the analysis. Yet upon closer look, an impression of an incomplete spiral orb- web outline is created as one follows the contour of the bottom of the design.

Figure 5.8. The front view rendition of the inner court of Kweku Ananse. Sketches made by Mawukplorm H. Adjahoe: waste designing (2021)

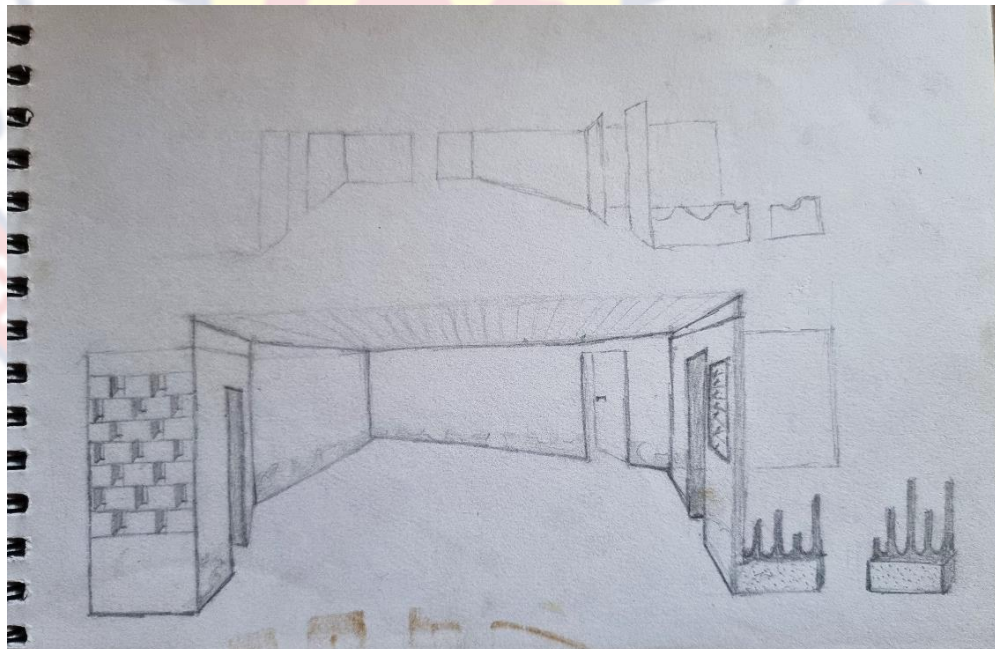I was intentional about not creating a fine symmetrical structure that is common in these post-colonial buildings, as I have always considered symmetrical designs to be drab and uninspiring. In this instance, however, it was not my intention to project the spider web. This only shows just how subconsciously I had assimilated the information on emulating the spider web to a point that it instinctively began to reflect in my subsequent designs. Though unplanned, the design and form contributed to the overall production concept.

Flanked on each side of the main structure are conjoined units of different designs. On the left is a series of blocks loosely laced to create a hollow impression – an impression of how Ghanaian societies previously engaged in an open-family system where everyone is able to train, correct, and raise another's child without reproach, because 'what happens to one person affects an entire community'. On the right are blocks spiked with glass of varying heights to accentuate the sense of inequality that engulfs the very existence of humans. In spite of being on a lower scale, Ananse tries to make money through dubious means and is eager to reach the same level as the wealthy.

Fortified with a fair knowledge of the façade of the set, I put on hold all forms of planning to begin full implementation. This was because time was also of the essence. Mechanical drawings are usually produced as an aid an in-depth instructional guide on how to position the scenery particularly in the absence of the designer. For the reason that I was the leader of the construction team, and that I would be present during the construction process, I did not draft any mechanical drawings. The lack of complexity in

the set that had been designed equally led to the conclusion that a functional model or production model was redundant at that point. And as a happy coincidence, my able project team easily understood my plan, so it was agreed that there was no need for the models.

Having prepared the instructional guide (i.e. the sketches), together with the production team and my project assistants, we implemented the set designed for The Marriage of Anansewa on 15th April, 2021. The sawdust-coated plastic sheets that were made out of water sachet plastics were used in building the wall of the courtyard. Keeping with the idea of minimal use of raw material, i.e. wood, the plastic sheets were joined at the hems by intersecting them on each leg of every other frame, using a stapling gun.

This arrangement created an impression of alternating angular and curvilinear outlines at the top which offset the rigid angular lines that predominantly characterized the set. We were unable to stay true to the design of the courtyard as presented in the sketches. This is because at the last minute, we decided to open up the performance space. This meant the quantity of the plastic screen was insufficient to advance with the original design plan. The result was an incomplete hexagon with a few openings that would be partially filled by trees located at these openings.

Figure 5.9. The plastic sheets were coated with sawdust and used in demarcating the performance space,i.e. the courtyard. Picture taken by Bismark Ofori (15th April, 2021) for Mawukplorm H. Adjahoe: waste designing (2021)

Again, the interior structure of Ananse's inner court which was originally designed to be within the walls of the courtyard became an isolated structure due to the reduction in the quantity of plastic screens. This instantly created an invisible divide between the acting field and the players' seating area, an event that I had been trying to prevent. To address this problem, the band was positioned in a manner to serve as the adjoining wall to the left. The space to the right became the main entrance to the courtyard. Plastic sheets were also planned to be applied over the plastic-woven flats to create the complete impression of a typical flat. However, the plastic sheets

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were insufficient even for the courtyard, let alone serving as a covering for the frames. For this reason, I ended up using waste paper in place of plastic sheets.

Waste papers, mainly sourced from the University of Cape Coast printing Press, and a couple other printing and photocopying shops on campus, were used as a substitute for the water sachet plastics in creating screens that would be used in veneering the front of the interior design which faces the players. The paper screens were prepared in the studio by gluing the edges together. This was done so that they exceeded the size of the flats by twelve inches all round, and were then transported to the set construction site for application. Considering the fragile nature of the paper screens, this was done to prevent their destruction even before construction began. Application of the paper screens to the plastic-woven flats was carried out before erecting the structure.

Figure 5.10. Application of the paper screens to the plastic-woven flats was done before mounting the set. Picture taken by Bismark Ofori (16th April, 2021) for Mawukplorm H. Adjahoe: waste designing (2021)

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The paper screens were used as a representation of plywood and fabric that are commonly used to cover wooden frames for stage flats. A variety of paintings and vista illustrations are done on these plywood pieces. As shown in the image above, (figure 5.1) a stack of waste paper strips which were used in masking all openings as well as correcting other anomalies identified during the construction process. The idea of using paper in place of plywood or fabric for this purpose was to validate the presumption that scenery can be made entirely from waste and still be able to produce whichever simulation is desired. The simulation here can range from the formation of impressions of windows, doors, fireplaces, on a smaller scale, to the painting of scenic impressions of towns, streets, forests, on a larger scale.

For fear that the paper screens could be drenched and destroyed by rain, the construction of interior structure was postponed to the morn of the performance day. Though it did not rain that night, Mother Nature had other plans for us on the day of construction. My worst fears played out right during construction of the interior design when a gust of wind razed nearly half of the erected structure unto the ground. At that point, I appreciated the efforts invested into creating the robust frames that partially withstood the force of nature. Although this event push-started the reset button on the construction process, it afforded the forum to learn to build an even more resilient fabric for future use. The downside however was that I had very limited time to work with.

Figure 5.12. A section of the destruction caused by the gust of wind during the construction of the interior design. Picture taken by Bismark Ofori (16th April, 2021) for Mawukplorm H. Adjahoe: waste designing (2021

Figure 5.12. A section of the destruction caused by the gust of wind during the construction of the interior design. Picture taken by Bismark Ofori (16th April, 2021) for Mawukplorm H. Adjahoe: waste designing (2021)

After remounting the scenery, we resorted to spraying the paper sheet covering as the consistent friction of the paint brush against the soft and wet paper could cause it to tear. Ananse was not counted among the rich until the end of the play when Chief-Who-Is-Chief claims the right to be

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Anansewa's husband by presenting the marriage items, thereby creating the assumption that Ananse would be a rich Father-in-law. Even then, I chose purple as the colour for the set, interpreting it to mean wealth (which Ananse so much desired of); royalty (which Anasewa would be married into); and bond (that Anansewa shared with her father, Ananse, her grandmother, Aya, and her aunt, Ekuwa).

The purple colour was tinted on two levels to create three different tones: the original purple, a fuchsia tone, and a pearly purple tone. These three levels represented the levels of colour interpretation given to the play-text. As purple represents, among other things, wealth, it embodied for the wealth that Ananse foresaw pending his daughter's marriage to Chief-Who-Is-Chief. The fuchsia purple represented the royal status that Anansewa would assume after her marriage, in becoming a queen to Chief-Who-Is-Chief. The toned down purple was to highlight her stance in the family as the 'second-in-command' to the husband. Lastly, the pearly purple signified the treasured bond of family – Anansewa's family: a bond for which her father, grandmother, and aunt were willing to sacrifice what they could to see to a better future for Anansewa.

Due to the large size of the spider-web, it was also constructed at the site. The spider-web stood as the focus of the interior design and served as a summary or representation of the concepts of the entire material building, set construction, and production. As stated earlier in the previous chapter, rug backing was used as the silk in spinning the web. This material was tied to 2½ inch nails that were hammered into the joints of the pentagon-

shaped frame. The wooden frame was to serve as the final outline of the web and also provide a holding for the soft material in the form of the rug backing.

Figure 5.13. The spinning of the spiral orb-web using the rug backing and wooden frame as materials. Picture taken by Bismark Ofori (16th April, 2021) for Mawukplorm H. Adjahoe: waste designing (2021)

In contrast to the sketches and the plans outlined, the constructed scenery assumed a marginally modified appearance as a result of a combination of artificial and natural causes – natural cause of time worked against the team and we also run short of some essential materials that could complete the scenery. The painting on the paper did not appear as it would on wood as the paper soaked the paint. Anymore layer of painting would weaken the sheet and cause more folds to appear. In the end the interior design appeared as:

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Figure 5.14. The front view of the interior court of Ananse. Hung to the left of the set is the screen on which visuals from the material construction process were projected. Picture taken by Bismark Ofori (16th April, 2021) for Mawukplorm H. Adjahoe: waste design (2021)

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Figure 5.15. The complete look of the performance space with the back of the interior court in view. Picture taken by Bismark Ofori (16th April, 2021) for Mawukplorm H. Adjahoe: waste designing (2021).

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Evaluation has been discussed in this work as an important tool at every stage of every design work. While it manifests in every step, its essence is equally revealed at the end of implementing the design work. Of this final review or evaluation, Gillette (2013), asserts that it

> […] is not so much a back-patting session as an examination of the methods and materials used to reach the final design goal. All designers should evaluate their selections to see if they were appropriate and to determine if they could be used in the future in another context (p. 36).

Ultimately, the key takeaway in this assertion is in the latter part where it encourages designers to consider appropriateness and reusability. Gillette does not advocate environmentally friendly materials. However, even though it is not clearly outlined, he advocates for the need to recycle the set as opposed to encouraging designers to produce a single-use set. The move is not only in line with the increasingly popular green theatre precept of designing more stock sets, but also with the environmentalist call to make more reusable objects. In evaluating the selection made for the final implementation, I consider three objectives – functionality, appropriateness, and reusability.

The primary function of every scenic design is to provide an environment for the play. In other words, it is to establish a visual representation of the imagination of the playwright with creative inputs from the designer and the director. In the play *The Marriage of Anansewa*, there is

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no clear description of the setting, although a general indication of the setting points towards contemporary Ghanaian society which is quite broad. It does however indicate the properties used in the play. It behoves on the designer therefore to read between the lines to glean general ideas of what the scenery would look like. My first point of consideration for ideas was the names of the characters and towns; the second was the period in which the play was written; the third, the local language in the play, if any; fourth, the kind of play; and finally, the background of the playwright.

The names of the characters and towns suggested an Akan setting in Ghana; the period was post-colonial; and the few instances of local language in the play were presented in *Fante*; the play is a comedy modeled against a Ghanaian folktale; and the playwright is an Akan, a Fante for that matter who hailed from Cape Coast. Based on these indications, the setting was chosen to be in a *Fanteland* in postcolonial Ghana. With these in mind, I applied my creative imagination in dictating how the final set would appear. In other instances where this play was performed, the stage was mostly bare, with only the properties in view. The only scenic element is the spider web either in the form of painting, or in the form of moulding.

This scenery certainly achieved the purpose of creating a staging area for an action, even extending beyond to create a space wherein audience members would be seated, who in this instance would be considered players. The scenery would be appropriate on the basis that the choice of colours for the set depicted the kind of play. In addition, the spider's web emphasized both the centrality of the main character as well as

the concept of the production. In terms of reusability, which is the third objective, the form of the flat implied that the materials could be stored and reused in a different context. The set was not designed specifically for this play, but could in fact be used for another production. Was it appropriate in line with the underlying sustainability principle of the study? To evaluate and appreciate the level of greening theatre, the elements of reusability and the sustainability of designing with waste are discussed further in the following topic.

Sustainability and Waste Designing

Sustainability is the driving force behind this study. Aaron S. Allen provides an interesting read on the critique of sustainability from the perspective of music and sound studies, and how it is understood by academia and industry players (see Allen, 2019). He establishes a dichotomy of how sustainability has been applied in various fields as one, when it means to continue on the same path; and two, it means to change, to do something differently. On the one hand is what he refers to as "sustainability-maintain", and on the other hand is what he calls "sustainability-change". These seemingly self-explanatory concepts derive their description from their etymological roots. To borrow his words, "Sustainability-change reimagines modern human civilizations on new, potentially progressive paths; sustainability-maintain keeps us navigating our established, destructive routes" (p. 44).

He raises a genuine concern when it comes to these concepts, in that

"sometimes an appeal to sustainability-change is used as a guise for doing sustainability-maintain" (p. 44). In the end, the sustainability component is masked by actions that encourage destruction, so our actions only sound sustainable. There is therefore the need to review the methods to ascertain levels of 'sounding sustainable' and actually 'doing sustainable'. In evaluating this project, I had a discussion with three colleague designers (Agnes Adomako- Mensah, Nash Neequaye, and Comfort Effina-Williams) to objectively analyse the concept, the methodology, and the end result. As they were not present during the processes, I shared with them footages of the production.

In this project, I set off to ignite a change in the narrative of set designing for theatre performances in Ghana by finding value in waste materials as an alternative to wood, in contributing to environmental sustainability on one scale, and economic sustainability on the other. Additionally, the project was to rekindle the cultural performance of the Ghanaian art of story-telling by impressing a kind of performance that takes cognizance of the diverse cultures that have interacted with the art culture in Ghana.

The combined weight of all the plastics that were used in building the materials for the set construction was ninety-two kilograms; the waste paper weighed approximately six kilograms; while the sawdust weighed twenty-seven kilograms, totalling one hundred and twenty-five kilograms of waste. Of the three kinds of waste stated above, paper and sawdust are biodegradable. For that matter, discussion on sustainability will focus on the

plastic waste, in terms of waste production and management.

As part of creating a sustainable pathway towards responsible consumption and production, the UN identifies reduction in waste generation through prevention, reduction, recycling and reuse as one of its targets (SDG 12 – responsible consumption and production – target 5). The waste materials employed for the purposes of waste designing were intercepted at their points of production. Although I was incapable of preventing its production in the first place, I was able to prevent at least ninety-two kilograms of the plastic waste from adding on to the heap at the dumpsites, to influence a reduction in the total greenhouse gas emission (SDG 13 – climate action – target 2, indicator 2).

The plastic waste prevented from being washed into the water bodies to harm aquatic lives, thereby contributing to SDG 14 (life below water), target 2: "prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution". By reusing the waste material, the lifespan of the products have been prolonged for additional number of years before finally reaching the incinerator, dependent on their non- recyclability at the end of life cycle.

In the discussion, other materials in vogue for scenery construction that produce a quality aesthetic appeal were outlined as Perspex, resin, polystyrene, fibre glass, and foam core. These materials are sourced for well-funded projects to buttress the wood. Meanwhile, majority of these materials were considered to be non-recyclable, particularly in events of specific-tailored designs for productions. Others can be reused in two or three

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different contexts, and they would have served their purpose. It was thus concluded that for the reason of environmental sustainability, waste designing is a good concept that calls for more practical research.

While waste designing on a whole creates an impression of doing sustainability, some methods nearly defeated this purpose to create an impression of only sounding sustainable. An instance is the method of recycling where the plastic waste was tested through melting and mixing with sand for block casting. Yet SDG 12 (responsible consumption and production), target 4 enjoins a production process that seeks to "achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment".

Although the use of plastic waste for this project reduced its release into soil and water, melting the plastics in such manner as during the testing phase did not only contravene a sound management of all waste, but also increased the release of toxic chemicals into the air to negatively impact human health. It is essential therefore for recycling agencies to consider an all-round sustainable method of recycling waste plastics and other waste materials so they do not only sound sustainable, but actually do sustainable. Secondly, casting the molten- plastic-sand block implied a sense of non-recyclability in case the blocks are worn out. It was for these considerations that this method was halted.

On an economic level, waste designing in itself is cost effective

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compared to using wood and other raw materials. In every theatre performance, mostly the technical component: set design, costume design, publicity, and in some instances, lighting design consume a huge chunk of the budget. Aside it being labour intensive due to the lack of appropriate facilities to ease on the manpower, which could easily translate as being costly, the physical money was to manifest waste designing was relatively minimal.

The actual cost incurred in this waste designing project was in the payment of labour for segregating the non-biodegradable waste from the degradable waste. A total of approximately one hundred and fifty Ghana Cedis (GHS 150.00) was paid to the workers at the resorts and restaurants for their labour. On a normal day, that amount would only be sufficient for four sheets of plywood, and that is at the time of designing this project.

It is through culture that significant phenomena are transmitted from generation to generation. History has shown that generations modify customs in accordance with established social guidelines. As a result of this, continuity is established and generations are able to remain connected and the family remains cohesive. Cultural dynamics affect the way we live our lives, including the way we express ourselves through art forms such as drama. With the world becoming increasingly globalized and increasing in transcultural interactions, recreating the true form of the story-telling art would entail the arduous task of recreating an entire social period when the family system was even entirely different.

Scenic design in the world of drama exists as a component of

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Western drama, which has been accepted as part of the performance culture with few generational modifications. Similarly, scenic design is operationalized within a specific performance context. For this project, the context of story-telling served as the basis for the operation of the set design. The dynamics of these two incongruous cultures provided the platform to create a hybrid culture that is tolerant of the diverse performing arts at play. Hybridity in this sense is in description of the creation of the performance world outside of the usual proscenium theatre and the natural environment of people's homes. This is a presentation of culture in a completely different direction.

Following the arguments in culture as, for and in sustainability (Dessein, Fairchlough, et al., 2015) culture in the form of performing art is seen in the performance of sustainability on two levels: culture in, and culture for sustainability. In the first instance, culture performs the role of "creating sustainability. Here culture takes on its evolutionary, holistic and transformative role, providing a new paradigm to the question of sustainable development" (p. 31). Culture herein refers to both the culture of set design, as well as the culture of performing art.

An evolution in set creation within a sustainable framework of alternative material selection, i.e. waste materials, provide a new paradigm to how scenic designers could contribute to the discourse on sustainability and beyond. Likewise, the combination of indigenous and Western performance cultures provide a transformative support for the diverse human cultures and their practices that give meaning, fulfillment, value, and

joy. These are reflective of the categorization of culture as described by Williams (1998) as normative, performative, and connotative.

Culture becomes the mediating force between the ecological, social, and economic dimensions of sustainability on the second level of role performance. A shift in the current culture of set design and construction, i.e. the cultural dimension, suggests a major component that acts as a bonding agent in this project, primarily the ecological and economic proponents. The cultural variable connects the dimensions, allowing for progress toward achieving a sustainable economy and environment. The use of waste materials helps to reduce production costs while also fighting pollution in all forms, deforestation, and the preservation of loss of biodiversity as the SDG 15 (life on land), target 5 enjoins all nations to "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."

To promulgate the social dimension, the innovative form of performance that served the capacity of providing context for set design also provided space to educate the surrounding society on waste management and its relevance. The closer society will then promote this waste management technique to a wider audience whenever they discuss their experience at the theatre performance. In similar vein, the SDG 4 (quality education), target 7 enjoins all nations to by 2030, "ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and

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sustainable lifestyles […]."

This comes at an opportune time to me as an educationist, to incorporate lessons learned from the waste designing process into the curricular for teaching technical theatre. Students will be gradually eased into the sustainable design techniques and encouraged to consider the global discourse on the four dimensions of sustainability. In a bid to embed society with the practice of waste recycling, I attempted to address the issue from the grassroots by teaching little children between the ages of eight and eighteen property building using waste plastic and glass.

This was during my internship at the then Community Youth Cultural Centre (CYCC), now Community Education and Youth Development (CEYD) in Kawukudi, Accra. The CEYD like the CNC also runs periodic skill acquisition classes for children during their long school recess. I shared my research ideas with colleagues at the CEYD and for the first time, waste plastic and glass bottles were recycled into purses to hold their stationery; flowers, and flower vases. An exhibition was held on the last of the class to display all items that the children learned to make during the period, after which their creations were given to them to be taken home.

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Figure 5.16. Highlights from teaching and exhibiting waste recycling at the then CYCC. In the picture are the Director of the Centre, Dr. Akosua Abdallah, dignitaries from the Danish Embassy, some staff of the CYCC, and the students.

Colleague designers with whom I had the post-production evaluation revealed that they equally leverage on their positions as teachers in Basic Schools to train their students to recycle by using plastic waste sachet to create fine art works; cardboard, and PVC nylon carton box packaging strips to weave baskets, jerricans (what Ghanaians call Kuffuor gallons) to build artworks, among others. At the same time, they as designers had used materials they would consider waste as components of their designs, especially when funding was not forthcoming. They had however not designed an entire set from waste materials.

Keeping the cycle in motion

Using CE theory, waste designing aims for a zero-waste and zero-

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pollution economic system throughout the material lifecycle, from extraction to artistic transformation to final consumers. For the reason of waste designing being largely exploratory and experimental, a lot of waste of different kinds were gathered to ascertain what exactly to use for the purpose of a good design. Evidently, the remaining unused waste maintained their value as waste. Rather than burning, they were bagged and collected by waste management trucks in hope that they would be delivered to the right outfit for proper recycling.

A little over seven crates of glass bottles (each crate containing twenty- four bottles); and thirty-one wine bottles were also collected which could not be used for lack of skill and appropriate recycling mechanism. The Centre for National Culture (CNC) in Cape Coast runs periodic courses for the community members to acquire vocational skills in making clothing and clothing accessories. I therefore contacted the Centre to collect the glass to recycle for their clothing accessories. This way, the glass bottles are not indiscriminately disposed of but kept within a cycle of zero waste and zero pollution. The remaining waste papers were also returned to the Press to be given to individuals who were also agents of recycling.

The waste design flats were built by joining three individual blocks to form the structure. The reason behind this approach was to establish the reusability of the flats in different performance contexts and different design forms. The individual blocks were attached to each other using bolts and nuts to achieve the desired height and form for this production. In instances where a different height is required, the flats can be collapsed and rearranged to suit the design need of the production. In the same way, the

plastic strings were woven into the frames so that they could equally be removed and recycled into other designs.

The frames in themselves are equally built to be disintegrated and reshaped into other forms other than the square shape they assume. Using nuts and bolts in joining the blocks prolongs the damage time of the structure than the use of nails would have on the frames. Dwelling on the existing work relationship between myself and the CNC, I was approached by a staff to lend the flats to the Centre to use for their productions. This gave me a sense of fulfilment knowing that I had successfully communicated. To my amazement however, the flats are being used in the same manner they were utilized for the waste design project: the shape and form remained the same. The only visible modified element was the plywood which was used in place of waste sheets. This absolutely defeated the entire purpose of creating the structure. It was at this point that I realized that skills and creativity are critical in advancing in waste designing, ergo the need to intensify sustainability education.

According to the CE principle, at the lifetime end, materials return to either an industrial process or, in the case of a treated organic residue, safely back to the environment as in a natural regenerating cycle. For the quantity of sawdust that could not latch onto the plastic sheets, they were used as food the soil in my backyard garden. For the waste designed flats, the plastic bottles, and plastic sheets can be shipped of, at their lifetime end, to recycling companies such as Nelplast Ghana to be shredded as recycled into other materials to become resource for other forms of construction.

Towards a Blue Print for Designing with Waste

After addressing the critical concerns raised during and after production,and based on the lessons learned during the entire exercise, I generated a model to serve as a guide for the next attempt at waste designing to serve as a blue print for further testing and making of adjustments. I used the funnel to represent the theory of sustainability. The designing stages appear to not follow any linear or cyclical process because the entire method for the creation was iterative. As is suggestive of the model (see figure 5.17), there are no correct arrangements of the stages in generating a waste design. This is as a result of the back and forth in revisiting some stages to come up with the final design work for this research.

It is for this reason that a designer could choose to begin from articulation of what the problem is and move on to selection of materials and chose the steps as is befitting for the experiment. Thus, depending on what is being researched into at what particular point in time, designers are at liberty to jump to and from one stage to another, as long as it works for the realization of the design being conceptualized and implemented.

One important thing to note however, is that in going through the stages, designers ought to consider the sustainability of the methods, materials, and process being applied – sustainability in terms of environment, economic, social, and cultural. Sustainability thence becomes the channel through which all the stages are passed in arriving at the end product which is the waste design.
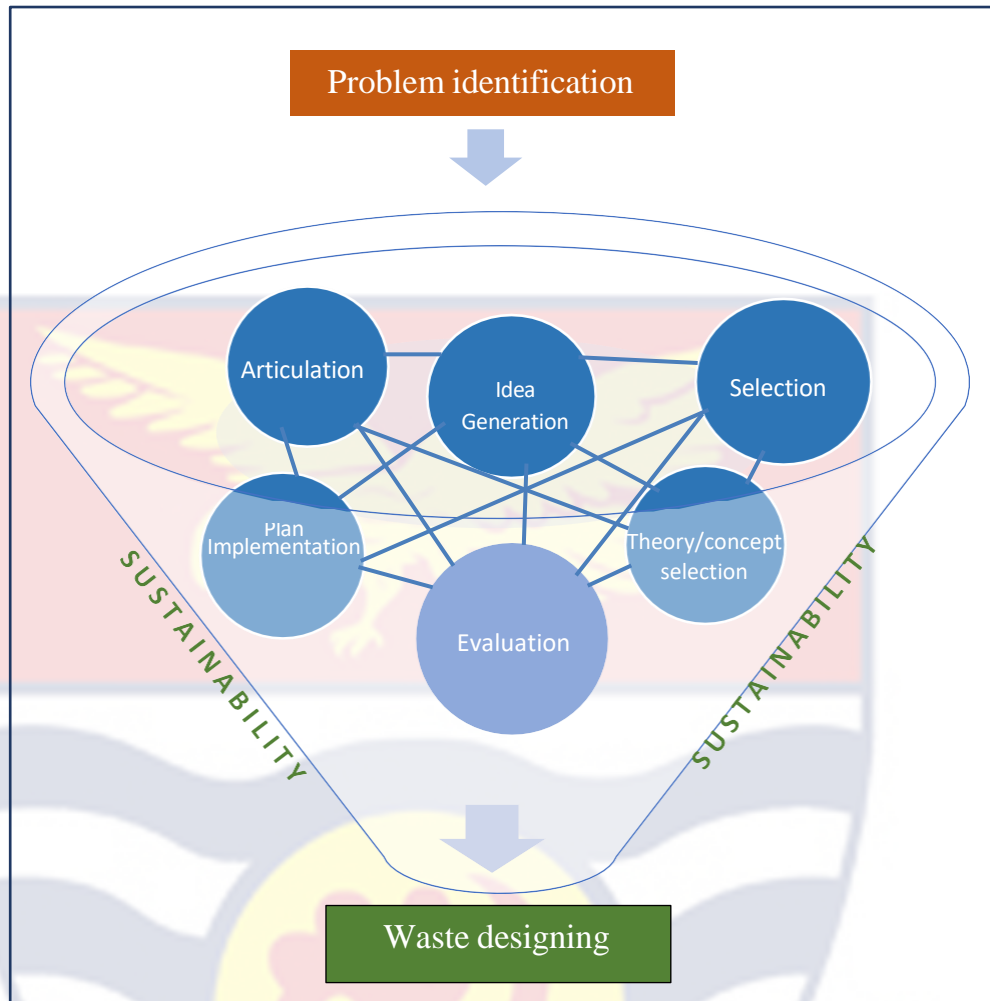
Figure 5.17. Towards a model for waste designing. Source: Mawukplorm H. Adjahoe, waste designing (2021)

Positioning Scenic Design in Activism

Most people associate activism with the concept of protest. This approach to the term may lead us to the realization that it is not always an action that defines us (Pal, 2010). It is incorrect to believe that we are not activists because we do not participate in protests. As members of the community, we are all involved in the creation and maintenance of the system in which we live. We are active at times by directly supporting the structure and simply agreeing with it, and at other times by actively opposing

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the structures. This is what I call 'performative activism', where we perform, back up our words with action, and demonstrate our agreement or opposition. Even when we ignore certain ideas and delegate decision-making authority to others, we are equally active. 'Non- performative activism' is the term I use to describe this type of subtle activism.

When we disagree with certain structures, we organize alternative versions that we believe are superior. We all have the right to our own opinions and convictions under our human rights. However, given the rate at which the ecosystem is depleting, we cannot afford to rely on rights to act selfishly. In the UN Climate Change Conference in Glasgow (COP26), from October 31 to November 12 2021, the Secretary General, Antonio Guterres sounded the alarm for the need to expedite action on climate change, adding that the climate action struggle requires all hands to be on deck because it is everyone's responsibility.

Waste production, land degradation, deforestation are contributors to carbon emissions that change the climate. In this project, set design was thus employed as an act of defiance, a form of resistance. Resistance to what? To answer this question, I will attempt reading meaning into a line of conversation by one of my colleague designers during the post-production discussion.

The question was asked as to why I created flats to design the performance instead of moulding a garnished set to demonstrate some spectacle and aesthetics, because "the flats are boring and represented a rural setting [...] I really dislike repeating set. It is not a thing that I

encourage. It makes it look boring sometimes." In moulding a set, the design is made unique to that particular performance, such that after the performance a major part of the material cannot be reused because they have been cut out and shaped directly to fit the performance. That is the resistance waste designing is initiating. Of course the structures were made in form of flats, however, these same structures have been designed to be disintegrated and reintegrated over and over to suit as many contexts as could be. While we may not agree to the structure of repeated scenery, we ought to provide alternatives that may be considered better in sustainability terms. What then is/are the alternative(s)?

Live theatrical performances in particular offer an exceptional form of audience engagement that people may find more meaningful. Theatre is also a highly adaptable medium, able to be moulded over and over according to the vision of its social and cultural location. After the performance, a number of people approached me in expression of how delighted they were to experience another perspective of waste recycling. These people were not theatre practitioners, yet they were moved to action to consider how they could apply similar ideas to their disciplines.

It was concluded after the discussion that activism therefore must begin from the root – education. And rightly so. Through the journey of waste designing I came to the realization that as a student, I was trained using J. Michael Gillette's scholarly writings as the model. I grew into a trainer, and for the most part of my trainer years, I followed in the shoes of the one who trained me. I am not alone. Richard M. Isackes (2008, p. 41), writes in his critique of the pedagogy of scenic design that

In considering my own pedagogy, I have been forced to come to grips with two uncomfortable facts. First, my teaching of scene design was largely based on an unquestioned replication of the training I had received as a student. Second, there was a major disconnect between my practice as a designer and the theoretical methodology I was advancing in the classroom. As a consequence, I decided to reevaluate much of what I believed to be true about teaching scene design and contest many of my own previously held beliefs.

Likewise, in questioning the linearity of the design process that J. Michael Gillette so religiously advocates edition after edition that my focus shifted from the object in contention to the process of creating the object. As I have discussed earlier on, materials that have been promulgated in scholarly writings have primarily had little to no consideration for environmental sustainability. At this point, designing with waste could be the driving force to starting a discussion on the sustainability of technical theatre practice in Ghana – initiating a performative activism to matters of sustainability in performing arts.

This will be a form of contribution to SDG 13 (climate action), target 3, indicator 1 (climate action): "extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (*a*) national education policies; (*b*) curricula; (*c*) teacher education; and

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(*d*) student assessment to improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning."

Chapter Overview

In this chapter, the construction of scenery and the production process were analyzed. Under the topic of and of play performance, a discussion on the preliminary process to the performance was made. This discussion also entailed the review of the play which detailed some selected themes and provided a brief synopsis of the play. While the original copy has always been the run-to play for selection, I argue the choice in selecting an adapted version of the play as a means to promote the sustenance of the adapted version. Again, the concept that underpinned the production was discussed to have affected the form of presentation and to include the way of rehearsing to promote sustainability.

In the subsequent topics, a detail analysis of the processes applied in finalizing the implementation of the waste designing was done. All concepts, except for biomimicry and regenerative design, attempt to prescribe indicators to measure performance in their conceptualization. The sustainability theory and the theory of CE were used as indicators to measure the level of sustainability of the entire project. Similar to identifying moments of sustainability, instances where methods produced unsustainability are also discussed. Waste designing has also been discussed in line with its contribution to the identifiable SDGs – major of which are:

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SDGS 4 (quality education); 12 (responsible consumption and production);

13 (climate action); 14 (life below water); and 15 (life on land).

CHAPTER SIX

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

This chapter provides a summary of the entire thesis. The summary includes a recap of the study's purpose, the research questions addressed, highlights of the relevant literature reviewed, an overview of the research methods used, the types of data analysis performed, and a statement of the main findings. Following the summary are conclusions and recommendations based on the study's findings. The chapter is concluded with suggestions for further research.

Summary

The main issue that this study intended to address was the appropriation of waste materials for the purpose of designing scenery for a theatre performance. On the one hand, the topic of reducing reusing, repurposing, and recycling has engaged international bodies, environmentalists, and scholars alike for years; and the fact that reduction in waste production has a strong bearing on the total global carbon emission has been firmly established ipso facto. On the other hand, the advent of sustainability theories in manufacturing – production and reproduction; and engineering, and designing – brought in its wake an increasing interest in research that explores the nature of environmental un/sustainability and the

relationship that may exist between humans and nature. One of the relationship types that caught the attention of scholars since the late 1990s was the mentor-mentee relationship.

The relationship between nature and humans is built on three levels: nature as mentor, nature as measure, and nature and model. 'Nature' thus, becomes a central focus in both the process of material generation for production, and the production process itself. Against this background, I set out to explore possible means of modelling a scenery for a Ghanaian theatre performance.

Consequently, the general purpose of this study was to explore and experiment with possible alternative ways of designing and implementing set for a theatre performance. The aim was to contribute to solving the menace of non-recycling, non-reusing, and non-repurposing of materials that are rather considered as waste. Four specific objectives for achieving the purpose were: a) investigate into the extent to which the practice of set design in Ghana is un/sustainable; b) identify ways in which set designers (can) contribute to creating an eco-friendly future; c) discover and explore ways in which waste materials can be used for creating set and; d) experiment with the adaptation of the concept of biomimicry as a basis for designing with 'waste'.

Four research questions were set to help gain a deeper insight and skill into how to employ waste materials as main resource for a scenic production:

   a)   By what method(s) is/ are the practice of set designing in Ghana

un/sustainable?

b) In what ways can set designers contribute to the global pursuit of creating an eco-friendly future?

c) How can waste materials be adapted into creating set design for performances?

d) In what way is the concept of biomimicry adaptable as a basis for set designing with 'waste' materials?

Of the levels of approaching the design problem, the top to bottom approach – also known as problem-based approach – was identified as characterizing the process. Subsequently, pertinent literature was reviewed, first on the general concept of set designing and its development in Ghana, the ideation of ecological arts, and later on studies that establish regenerative design processes and products as a means to sustainability. The exact theories that were explored in the creation process were the *theory of circular economy* (Geissdoerfer et al., 2016; Kneese, 1988; Pearce & Turner, 1990; Suarez-Eiroa et al., 2018), *biomimicry theory* (Benyus, 1997; Dickinson, 1999; El-Zeiny, 2012; McGregor, 2013), and *cultural sustainability theory* (Dessein, Fairchlough, et al., 2015; Hawkes, 2001; Kagan, 2011, 2019; Kirchberg & Kagan, 2013).

The literature on scenic design focused on definitional issues, historical perspectives (global and local), and eco-scenography as a response to sustainability calls. The levels of scenery definition were discussed in terms of its functions, aesthetics, and its ability to serve as a communicative

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tool for change. Also, the different approaches to design works and products as a constituent of arts and arts in general terms, was discussed from viewpoints of their contribution to sustainability or otherwise. A debate was created around empirical evidences of design works that supported the ideology of green theatre and eco-scenography while assessing their sustainability in theory and in practice.

Overall, the research design used was eclectic, combining the strengths of various design approaches. The resulting design incorporated elements of applied research – based on the study's function; exploratory research – based on the purpose of the study; and experimental research – based on the extent of material manipulation for production. Methodologically, this study is discussed to possess characteristics of arts as a research tool. The Arts-based research (ABR) is employed in its capacity as a design within the qualitative research paradigm. Drawing from a historical perspective on the development of the ABR, theatre and for that matter scenery design was employed as a tool for enquiry in this study. Through this approach, preparation of the materials for the scenery, the construction of the scenery for the performance of the play *The Marriage of Anansewa: a musical* (adapted by John Edmundson Sam), and the performance itself, data were generated and analyzed.

Two dimensions of gathering data for this study are discussed here as being on two levels: generating data (through theatre performance), and collecting data (through interviews of some selected Ghanaian set designers). Additionally, specific procedures that were followed in generating and collecting data were also discussed. Methods of such

included the Cornock's cyclical pattern of activities (1983), the problem based approach model (Helms, Vattam, & Goel, 2006), and the seven-step design process (Gillette, 2013). Discussions also bordered on how the production was developed: from play selection to seeking permission to the final rendition of the performance. Methods are reflexively discussed with the theories established to produce a composite understanding of how each element of this study influences and affects the other.

The data analysis was done in two main stages: a preliminary analysis where the results of the first part of the data generation which focused on material production were presented and discussed, and the main analysis where the variables of set construction, play performance, and cultural context were brought together in order to see their areas of convergence and divergence within the sustainability framework. Descriptive tools were used to analyze the data. Sketches, photos, and summaries of observations made during the data generation process were among the descriptive tools. Deductive interpretivism was also utilized as a qualitative analytical technique.

Presentation of Major Findings

Following from the trend of analysis, the presentation of findings is done in two main stages. The first stage presents the findings on the first part of the research objectives which included the first two research questions. The questions focused on the designers' current approach to scenery implementation in the wake of sustainability issues. The second

stage then presents findings on the remaining two questions that aimed at identifying alternative materials and alternative approaches that are otherwise considered right in the sense of sustainability.

Findings on the Current Practice of Set Design

Firstly, it was established that the concept of set design exists within a broader structure of theatre performances which is a foreign concept of performance, but has gradually become the performance culture in Ghana beginning with the academic setting. Globally, or at least as revealed in literature, the traditional materials commonly used for set designing and construction include wood, metal, and plastic. Wood is the known go-to material because it is less expensive, while the other materials additionally require the acquisition of special skills before application. The plastic herein included in the list does refer to waste or used plastic, but as raw materials, to comprise of resin, foam core, polystyrene, perspex, and fibre glass.

These materials are employed in the molding of specific scenery to serve specific production contexts. In the event that the production is not repeated, the molded set becomes non-reusable and by extension, non-recyclable. In effect then, the menace of waste generation is continued as the materials become waste. In this instance then, the practice of the set design craft is considered unsustainable as the materials quickly become volatile. Again, it was indicated that within the theatre industry, the value of aesthetics trumps the understanding of sustainability. Producers usually consider recycled materials as possessing innate non-aesthetic appeal for which

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reason they prefer to find funding for the production of a design that reflects a clean aesthetic presentation.

Furthermore, set designers who have found subsistence in teaching basic school students (while still practicing) have nonetheless introduced the idea of waste recycling via their various creative design classes. In one class, which has the focus of fine artistry, students are equipped to create fascinating impressions using waste sachet plastics, used credit recharge cards, waste fabric, among others. These waste materials are used in montage creation in a manner that affords the materials some sense of worth. In another class, with a focus of basketry and weaving of sorts, the use of waste paper (old newspapers, old exercise books, waste printed sheets, old carton boxes, etcetera), is paramount. Other materials such as the PVC nylon carton box packaging strips are likewise used for basketry since they present in form of hard strips equal to the original material of wood canes.

While the use of these materials in creative arts can be considered environmentally-friendly, such an understanding is not the first point of consideration for the teachers. They first consider the materials in their economic value by the sense that firstly, they make up for inadequate funding for supplies for the class activities; and secondly, that they present a seemingly unique aesthetic assessment. In this case then, these materials reduce the financial implications of providing resources every time for every class.

The analysis also reveals that set designers have in the past incorporated and in the present still incorporate elements of waste materials

in their construction works, again for the reason of insufficient funding. Nevertheless, in the fight to gain the environmentalist's recognition of having to contribute to an ecologically friendly future, this exercise of teaching and creating art with materials is considered discernibly sustainable in the economic sense, and invariably, in its environmental sense.

Findings on Alternative Design Resources and Approaches

On the matter of discovering alternative design materials for the purpose of set designing, the identification process deviated from the conventional linear process outline. The exercise was entirely exploratory and material selection was determined through levels of artistic and scientific experimentations. Of the three methods applied, the processes of identification revealed a non- conformance stance to the arrangement of the stages in the original models that were adopted.

The application of Cornock's Cyclical Pattern of Activities (CPA) which followed a particular positioning of stages in a circular model resulted in a mixup of the stages, albeit maintaining its cyclical form. The CPA originally has the following stages in a circular presentation of the model: a) generation; b) selection; c) synthesis; d) articulation; e) presentation; and f) critical discussion. It was identified during the process that there were no clear-cut indications of which steps were being followed, particularly during the first three stages. Additionally, evaluation was a major effect on every stage of the process, for which reason the model assumed two clear classifications after its application to the study: first is

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the generative classification, and second, the evaluative classification.

On the one hand, generative classification for the study resulted as a) synthesis; b) generation; and c) selection. On the other hand, the evaluative classification comprised d) presentation; e) articulation; and f) critical discussion which could then lead back to the generative cycle of classification. The resultant model therefore had the cyclical generative classification as encased in the constant cycle of the evaluative classification (refer to figure 4.19). In a similar vein, the problem-based model for bio-mimicking as designed by Helms, Vattam, & Goel (2006), also resulted in a looped construction flow. The problem-based biomimicry model indicated the following in its design generation model: a) problem definition; b) reframe problem; c) biological solution search; d) define the biological solution; e) principle extraction; and f) principle application.

However, unlike the CPA, this problem-based model maintained its original arrangement of stages. The difference is established at the point of the biological solution search stage. For the reason that the initial biological solution identified could not solve the problem defined there was therefore, the need for a biological solution *re*search which created the loop in that area of the design process. Biomimicry moreover, makes an allowance of an open space for designers to fill up with whatever elements they deem fit for their works.

The initial selection of the bird nest as the biological element for mimicking proved unsuccessful. By virtue of the openness inherent in biomimicry, it was possible to *re*search (the italicized part of the word

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'research' indicates the return to that stage to search for another biological solution) into other organisms that served the purpose of providing a solution to my problem. Biomimicry presents three levels of emulating nature: organism feature, organism-community relationship, and organism-environment relationship. The biological organism solution for the study was of the spider and its web, and it was identified on the third level of organism-environment relationship.

The CPA and the problem-based biomimicry approach was applicable to the generation of the material later used for construction. The finding from the process application presents waste plastics of grades low-density polyethylene (LDPE), and polyethylene terephthalete (PET/PETE) as being easy to manipulate without any factory facility support. High-density polyethylene (HDPE) plastics were on the contrary demanding of extra facilities, such as shredder, for easy manipulation. This rendered the HDPE grade of plastics inapplicable in their original man-made state to the study.

Again it was determined that the method of remolding the waste plastics particularly of grades LDPE and polypropylene (PP) by melting was unsustainable as it posed a health hazard of emitting toxic gases into the atmosphere. In the end, water and beverage bottles belonging to grade PET, and water sachet plastics of grade LDPE were determined as conducive for the project based on the facilities available at the time of implementation.

Conclusion

First and foremost, one must recognize the inherent difficulty in attempting to apply a scientific model to artistic research. The biomimicry model has been applied in the use of raw materials as resources for design implantation. Employing waste materials that already assume certain forms and shapes nearly doubled the level of difficulty. Because of this, the scrutiny of the application of the approach must be viewed with some level of caution as measurement of its applicability in this instance, may not be on the same level as with the other instances. Secondly, since I am a part of the community of set designers in Ghana, some biases injected into this study were established from the perspectives of experience and observation. With arts being riddled in subjective opinions it is only important to note that some comments and descriptions were subjective although there was an attempt to create an objective balance.

Nonetheless, the findings point clearly that the practice of set design currently mostly points in the direction of unsustainability. Two major areas were identified as: material source and mode of designing. Materials are raw (sourced from natural resources), and made to fit particular performances after which reuse of the design is nominal. Sustainability of the craft is sacrificed in the face of gaining aesthetic appeal. However, the minimal use of waste materials in events of low budgets renders the practice worthwhile to the environmental agenda.

In line with such an agenda, waste materials have been identified as valuable to the cause of scenic designing. The manner of selection,

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application and implementation depends however, on the type of process(es) employed. Based on this study, the conclusion is likewise drawn on one level of the applicability of biomimicry to artistic design works which may circuitously relate to the applicability of other scientific models to artistry. Set design is not limited to only the proscenium theatre as has been the common practice, at least from observation of academic practice and its representation within the Cape Coast community (the Centre for National Culture included). It is possible to make cultural statements with scenic design outside of the confines of the auditorium walls.

While there were a number of success stories in the process and final output of this research, there were equally challenges that marred the attainment major feats. Some of these challenges were that which are common to experimental research – the element of time, and the unavailability of resources: in this case, the appropriate facility or technology to aid in an easy and suitable recycling of the waste materials. However, as this research is a basic research, laying the foundation for other researches to be built upon, it is understandable that solutions cannot be found for every problem. It is therefore concluded that challenges identified during the process, shall serve as the grounding for recommendations for further artistic or scientific research.

The use of arts based research (ABR) as a mode of enquiry was helpful. Indeed the expressivity in theatre as a tool has produced greater insights on the phenomenon of alternative material and design process generation for set construction. It has equally given a broad panoramic sight

into the nature of the relationship between arts and science. The design, limitations, the findings, and the recommendations for future research, together form a rich aggregate of information that can come together to act as a very fruitful step for further research.

Recommendations

First of all, it is important for designers to evaluate in retrospect their level of contribution to global discourse on sustainability. Designers should not take for granted the activism power of the theatre. Activism does not solely lie in the dialogues and monologues. Designers should consider their craft as an opportunity to make revolutionary statements. It is also important for designers to find aesthetics in sustainability – finding beauty in the ashes. It will be helpful therefore for set designers to adopt processes that can generate designs that are both appealing to the sight and gentle on the environment.

Secondly, although the repetition of set creates an unexciting design, in this era of climate change and talks of adapting to its effects, it is only prudent that designers explore other means of creating scenery that captures a sense of reusability, particularly within the industry. Since academic institutions mostly build stock sets while industry pursues one-time-use sets, designers need to find a balance between the two extremes to support the ideation of recycling for sustainability purposes. It is needful for industry players to also remain in close contact with academia to build reflexive course models that reflect the true situation on the ground.

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Speaking of academia, it is demanding learning and teaching institutions to incorporate sustainability research into curricular, particularly in this time of a height in the global discourse. Students must be kept abreast of such dialogues of global propensity to be able to make constructive decisions in their line of training, and be able also to make positive contributions. On this note then, it is significant to move beyond integrating waste materials on the basis of insufficient funding to full-fledged waste designing in various forms that has the environment in focus and invariably influences the funding component as well building a new cultural performance construct.

Interdisciplinary and transdisciplinary research and artistic projects should be encouraged where there would be collaboration between creatives, scientists, and engineers to explore more sustainable modes of recycling. Also, as a design concept targeted primarily at the academic institutions to further influence the theatre industry interface, waste designing would go a long way to ease on budgetary allocation for performances.

Last but not least, it is needful for theatre arts departments to enter into agreement with the production departments of the technical universities in their local settings. Every year, a number of students are churned out with skills in welding and engineering to produce machinery that would enhance manufacturing and production. A memorandum of understanding (MoU) between these institutions would imply that possible joint projects as students from the technical universities build machines for the design works of the students of the theatre arts departments. This would create an

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enabling environment for both sides to learn valuable lessons that would be of great benefit to the progress of their crafts.

For further studies, designers, scholars, and researchers are encouraged to zoom into the technological influence and impact of designing with waste. The presence of technological facilities could enhance the venture of design based purely of waste materials, likewise it could pose some unsustainability questions. It would be interesting to know the level of positive and negative impact of the use of technology in waste designing. Other methods of designing with waste could be explored to create a comparative impression based on sustainability of either methods derived. Art methods traditionally dictate the flow of design implementation. Biomimicry methods have been identified in this study to have a bearing on artistic design methods. What else is out there that could influence the creation of a sustainable practice?

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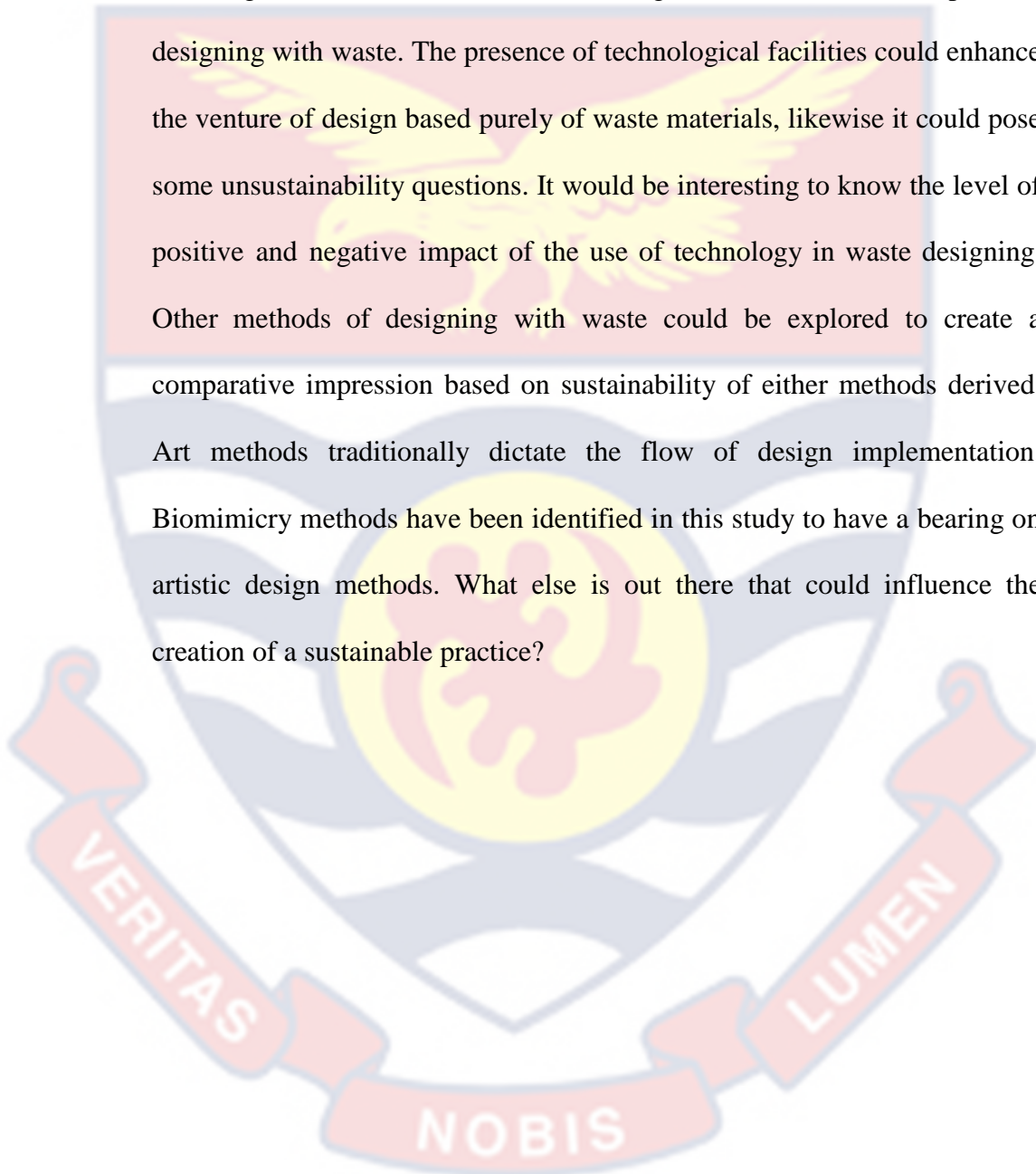
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APPENDICES

Appendix A

Scenic construction schedule

Activity	Date	Personnel involved	Remarks
Skill acquisition	September, 2020	Principal researcher, research assistant(s)	
Locate waste collection points	October, 2020		
Collection of waste materials	October 2020 - March, 2021	Principal researcher, research assistant(s)	
Studio work (testing and building)	February 12 – March, 2021	Principal researcher, research assistant(s)	*Tentative – possible to stretch beyond stipulated time
Scout for performance spaces	March, 2021	Principal researcher, research assistant(s)	
Construction of scenery	March/ April, 2021		
Exhibition/performance	March/ April, 2021	Principal researcher, research assistant(s), cast and crew	*Tentative – dependent on studio time
Break	April, 2021	Principal researcher	

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Appendix B

Production rehearsal schedule (*The Marriage of Anansewa*)

Date/ Week	Activity
Mon, Sept. 21, 2020	Auditions
Thurs. Sept. 24, 2020	7.00 pm - Meeting with Cast
Week 1 (Jan. 20 – 22, 2021)	6.00 pm – read through/ establishing character description
Week 2 (Jan. 25 – 29, 2021)	Blocking of Act 1
Week 3 (Feb. 1 – 5, 2021)	Blocking of Act 1/ 2
Week 4 (Feb. 8 – 12, 2021)	Blocking of Act 2
Week 5 (Feb. 17 – 20, 2021)	Learning of songs
Week 6 (Feb. 22 – 25, 2021)	Learning of songs/ review blocking for Acts 1 and 2
Week 7 (Mar. 1 – 4, 2021)	Blocking of Act 3
Week 8 (Mar. 9 – 12, 2021)	Blocking of Act 4
Week 9 (Mar. 15 – 19, 2021)	Polish songs/ rehearsal with John Edmundson Sam
Week 10 (Mar. 22 – 26, 2021)	Polish songs/ review blockings for Acts 3/ choreograph of dances
Week 11 (Mar. 29 – Apr. 2, 2021)	Review blockings for Act 4/ rehearsal with band
Week 12 (Apr. 5 – 9, 2021)	Run thru show/ review blockings/ rehearsal with band
Week 13 (Apr. 12 – 15, 2021)	Run thru show/ attempt tech and dress/ firm dances and choreographies/ construction of scenery begins
April 16, 2021	5.00 pm – Call 6.00 pm – House opens 6.30 pm – Performance

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Appendix C

Cast and Crew list for *The Marriage of Anansewa*

The Cast

George Kweku Ananse:	Samuel Addai
Anansewa:	Mawukplorm Harriet Adjahoe
Christiana Yamoah:	Denise Darah
Aya:	Araba Korsah
Ekuwa:	Ivy Akuoko Gyimah
Story Teller:	Kimberly Josephine Sampson
Akosua:	Benedicta Arthur
Akwasi:	Solomon Boateng
Property Man:	Freda Sakyibea Akyeam
Postman:	Louisa Woedem Gadzekpo
Maidens:	Agnes Acquah
	Adezewa Dadzie
	Elizabeth Afoakwa
	Ashthy Ayensu Amponsah
	Pearl Akurugu
	Beverly Elinam Agbanu
	Anita William

Messengers:

From Chief of Mines:	Humphrey Doku
	Rafiq Kwakwa
From Chief of Akate:	Francis Kwaw
	Lebene Dante Yankah
	Beverly Elinam Agbanu

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From Chief of Sapaase:	Marilyn Parker Longdon
	Florence Asimeh

From Chief-Who-Is-Chief:	David Chapman Quayson
	Solomon Boateng
	Melody Ohemaa Konadu
	Pearl Akurugu
	Josephine Aba Kwansima Quarshie

Chorus:	All cast and crew, level 100 students of the Department of Theatre and Film Studies, UCC

Carpenters and Masons:	William Frimpong
	Kojo Bentsil Odoom
	Daniel Kumah

Choreographers and dancers:	Joseph Alanyo
	Ishmael Arthur
	Daniel Aihoon
	Papa Akrofi Bruce
	Agnes Acquah
	Adezewa Dadzie
	Nana Ekow Prah
	Alfred Amoah

The Crew

|	
Director:	Stephen Koomson
Stage Manager:	Ann-Marie Ahene-Affoh
Costume and make-up:	Alicia Yaa Fosua Osei
Scenic designer:	Mawukplorm Harriet Adjahoe
Lighting technician:	Emmanuel Gbedeh
Sound technicians:	Albert Essuman Arthur
	Humphrey Doku

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Band: Albert Yarquah – lead guitar
Eric Debrah Otchere – rhythm guitar
Kizito Abizi – percussion

Koo Ntakra – percussion
Precious Garchie – bell
Paul Kojo Yalley – bass guitar

Backing vocals: Mercy Akyianu
Uriel Nutifafa Lotsu

Camera: Bismark Ofori
Emmanuel Gbedeh
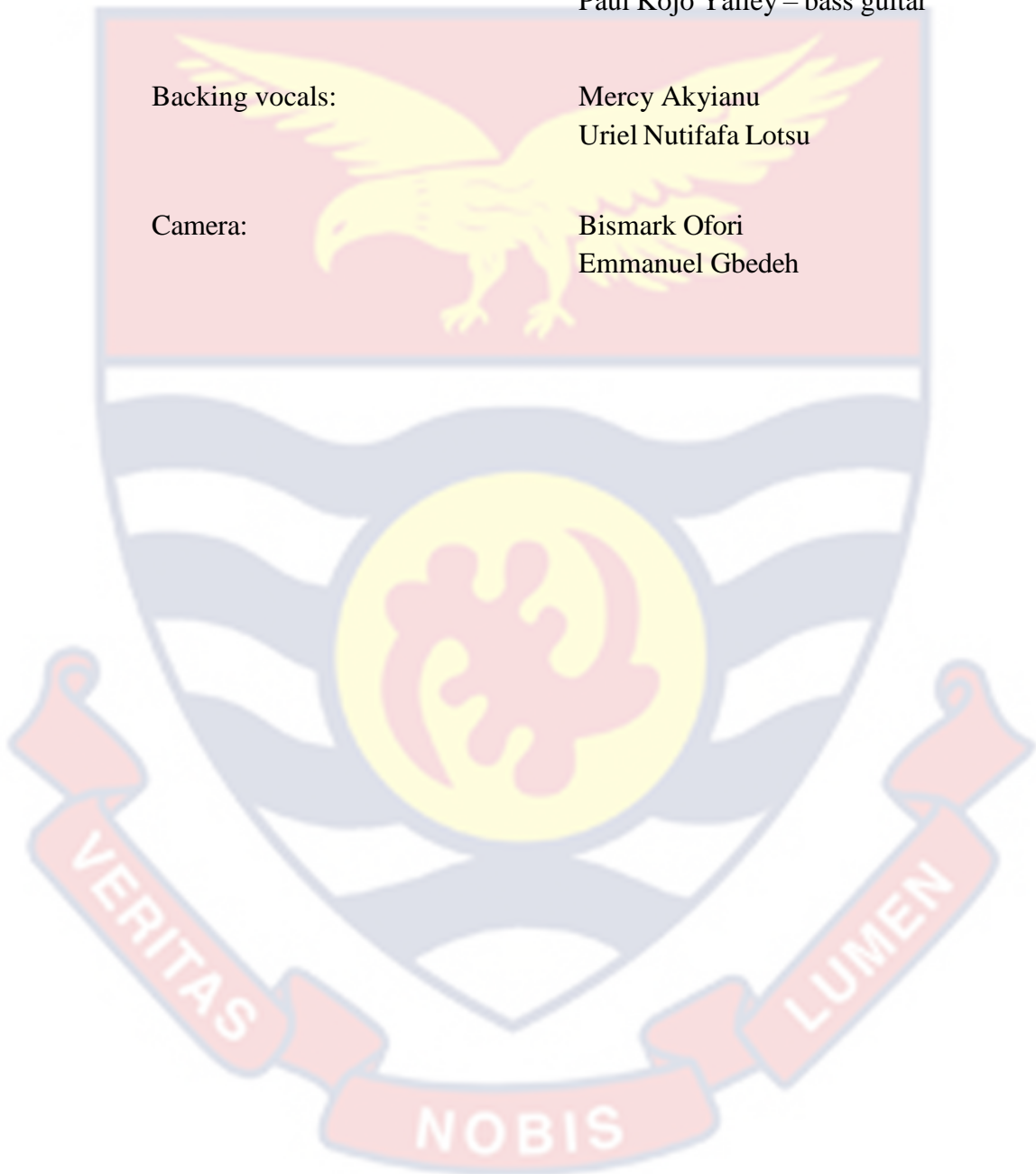
Appendix D

Estimated Budget for the production of *The Marriage of Anansewa*

Item	Unit price (GHC)	Quantity	Total (GHC)
Collection of waste			150.00
Bolts and nuts	0.50 p	136	68.00
Wawa board	31.50	10	315.00
Nails (3")	7.00 per pound	2	14.00
Transportation			40.00
Refreshment: Water Beverages Snacks	3.50 27.00 2.00	39 5 60 x 5	136.50 135.00 300.00
Hiring of truck to convey the flats to construction site			350.00
Grand Total			**1,508.50**

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Appendix E

Table of the list of materials and tools used for set design and construction

for *The Marriage of Anansewa*

Materials	Tools
Nails	Circular saw
Bolts and nuts	Hammer
White glue	G-clamps
Wawa board	Soldering iron
Waste plastics	Iron
Saw dust	Stapler gun
Waste rope	Industrial drill
Waste paper	Screw driver (power)
Old calendar	Hand saw
	Paint spraying machine (power)

Appendix F

Letter of request for chairs to seat the audiences

Centre for African and International Studies
Faculty of Arts
University of Cape Coast Cape Coast

1st April, 2021

The Head
Estate and Development Section
University of Cape Coast
Cape Coast

Thru:

The Director
Centre for African and International Studies
Faculty of Arts
University of Cape Coast

Dear Sir,

REQUEST FOR PLASTIC CHAIRS

I am a PhD candidate at the Centre for African and International Studies with registration number AR/PAS/19/0003.

My research, entitled *Waste as a resource: Rethinking set design through biomimicry for a sustainable ecology*, borders on exploring the use of plastic and glass waste in creating an environment (set design) for a play production. Thus, there is the need for a practical component where I use the waste materials to create the acting space for a live theatre performance.
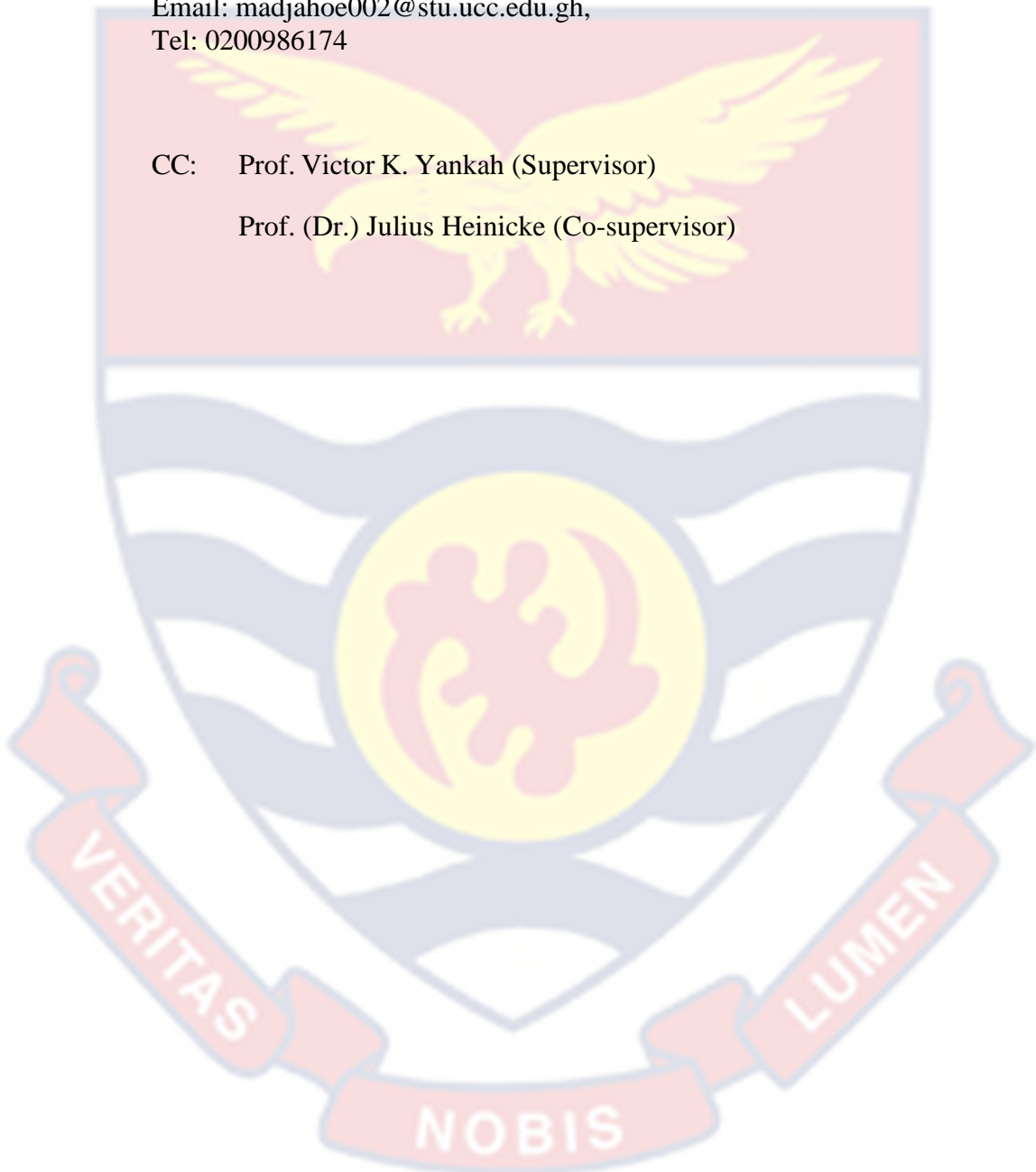
Considering the nature of the play as well as the Covid-19 situation and restrictions, it will be more expedient to hold this academic exercise outdoors. I am therefore by this letter, humbly requesting for **200 plasti**c chairs for use at the performance space. The exercise is scheduled for **Friday, 16th April 2021, at 6.00 pm.**

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I hope my request will meet your kind consideration. Thank you.

Yours Sincerely

Mawukplorm H. A. Adjahoe
Email: madjahoe002@stu.ucc.edu.gh,
Tel: 0200986174

CC: Prof. Victor K. Yankah (Supervisor)

       Prof. (Dr.) Julius Heinicke (Co-supervisor)

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Appendix G

Letter of request for use of performance space

Centre for African and International Studies
Faculty of Arts
University of Cape Coast
Cape Coast

1st April, 2021

The Director
Directorate of Public Affairs
University of Cape Coast
Cape Coast

Thru:

The Director
Centre for African and International Studies
Faculty of Arts
University of Cape Coast

Dear Sir,

REQUEST FOR USE OF THE CONGREGATION GROUNDS

I am a PhD candidate at the Centre for African and International Studies with registration number AR/PAS/19/0003.

My research, entitled *Waste as a resource: Rethinking set design through biomimicry for a sustainable ecology*, borders on exploring the use of plastic and glass waste in creating an environment (set design) for a play (theatrical) production. Thus, there is the need for a practical component where I use the waste materials to create the acting space for a live theatre performance.

Considering the nature of the play as well as the Covid-19 situation and restrictions, it will be more expedient to hold this academic exercise outdoors. I am therefore by this letter, humbly requesting for the use of the
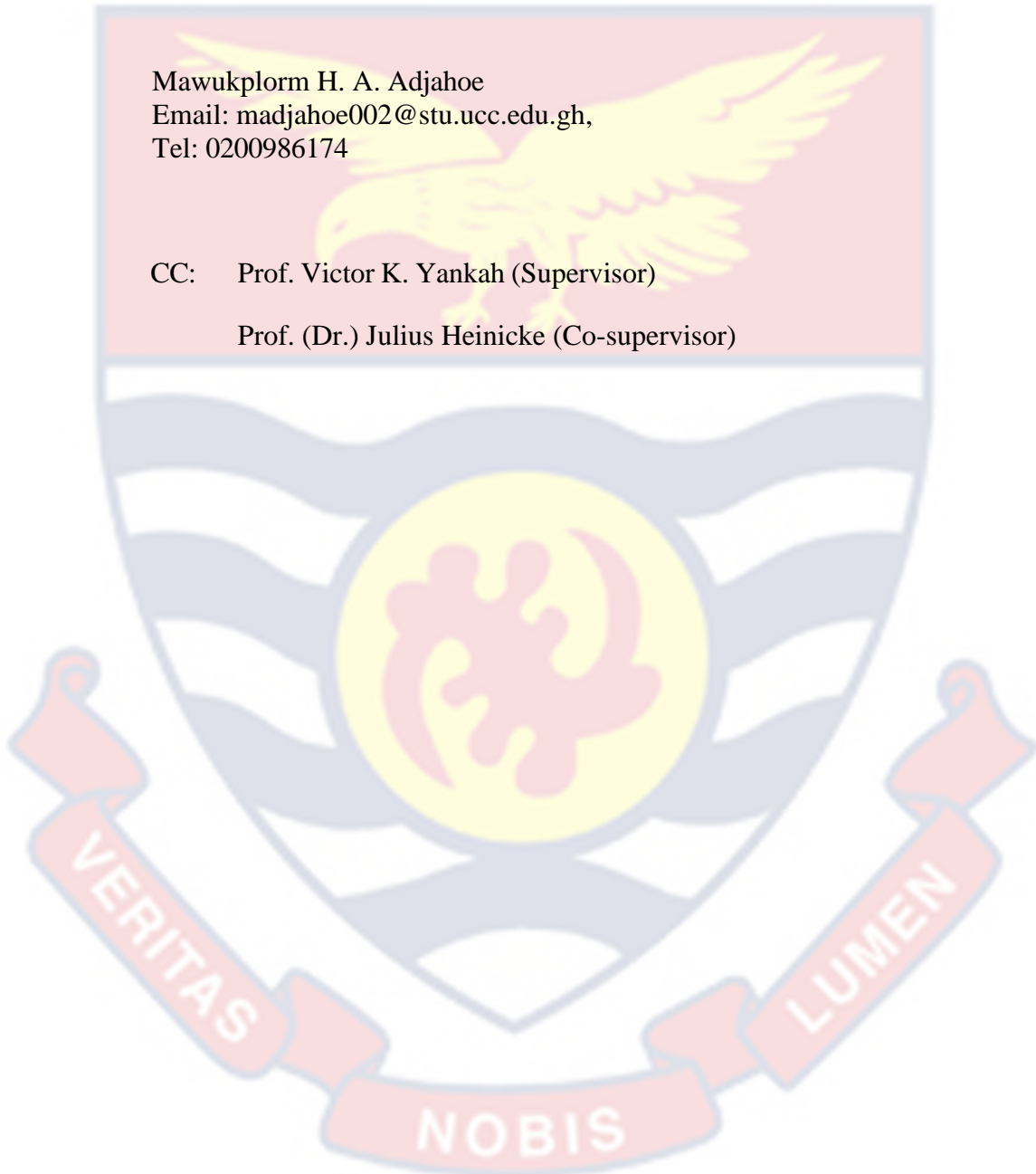
Congregation Grounds as the performance space. The exercise is scheduled for **Wednesday 14th to Friday, 16th April 2021, at 6.00 pm.**

I hope my request will meet your kind consideration. Thank you.
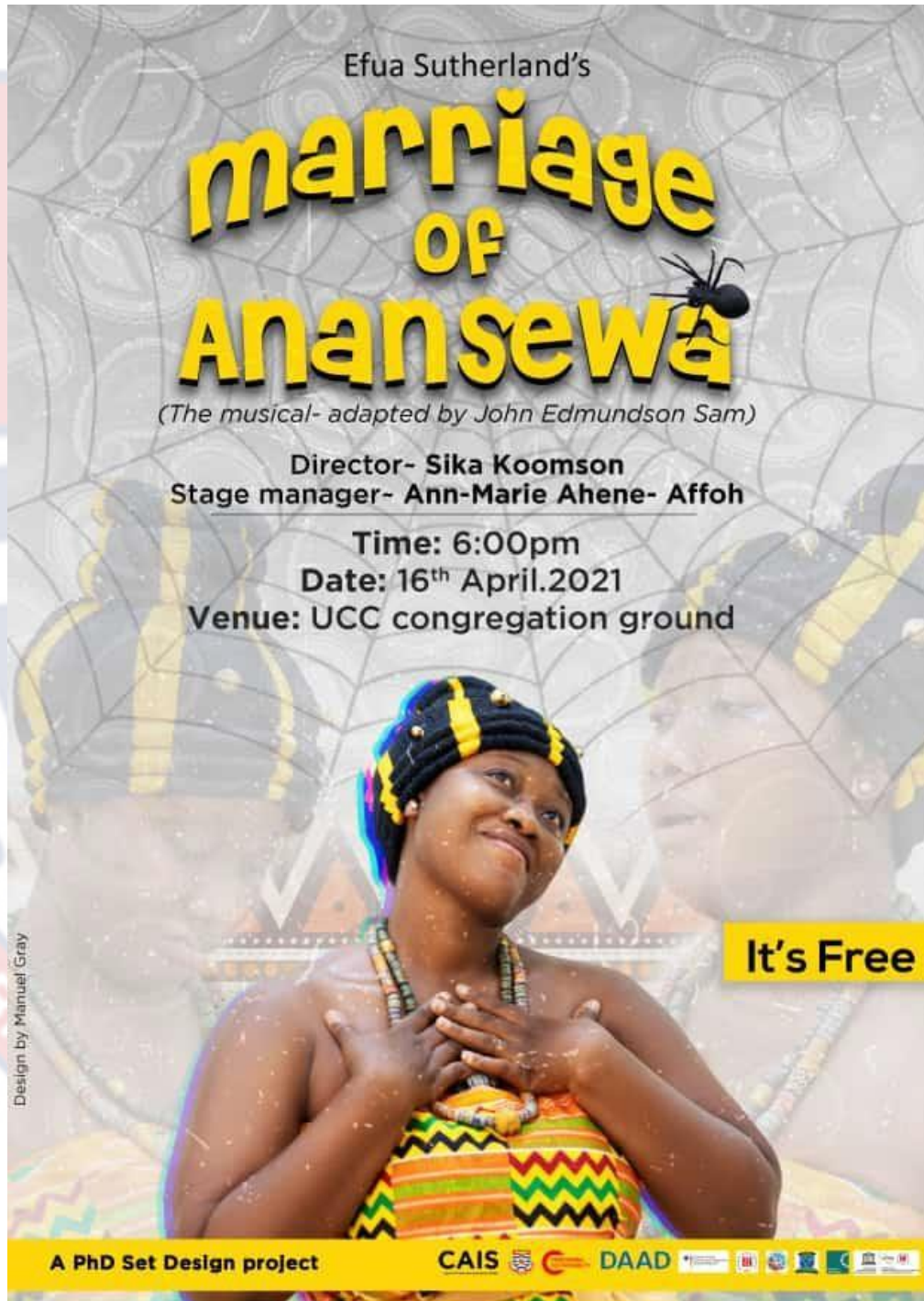
Yours Sincerely

Mawukplorm H. A. Adjahoe
Email: madjahoe002@stu.ucc.edu.gh,
Tel: 0200986174

CC: Prof. Victor K. Yankah (Supervisor)

          Prof. (Dr.) Julius Heinicke (Co-supervisor)

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Appendix H

Flyer of the production of *The marriage of Anansewa: The musical*