



SUSTAINABLE  
DEVELOPMENT  
GOALS

# 2030 AND THE SDGs

“ The Agenda 2030  
and the SDGs: Which way  
**NIGERIA** and **AFRICA?** ”

A Compendium of Progress,  
Challenges and Opportunities.



Edited by

**Prof. Tayo Ajayi**

**Dr. Teslim Ojuromi**

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Lagos State University Centre for the Actualisation of  
United Nations Sustainable Development Goals  
(LASU-SDG)

# **At the midpoint of Agenda 2030 and the Sustainable Development Goals: Which way Nigeria and Africa?**

**A book by  
The Lagos State University Centre for the Actualisation of the United Nations  
Sustainable Development Goals**

**Edited**

**by**

**Prof Tayo Ajayi  
Dr Teslim Ojuromi  
Dr (Mrs) Olayemi Soladoye**



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## FOREWORD

I am deeply honoured to present this maiden publication of Lagos State University Center for the Actualization of the United Nations Sustainable Development Goals (LASU-SDG), entitled "At the Midpoint of Agenda 2030 Sustainable Development Goals: Which Way Nigeria and Africa?" This volume affirms the university's unalloyed commitment to nurturing and strengthening intellectual climate conducive to stimulating teaching and research in issues relevant to attaining the 17 Sustainable Development Goals (SDGs). At the heart of the global initiative to implement the SDGs is the necessity for strategic communication of policy frameworks at the national, regional, and international levels. These frameworks are designed to inspire actions that will help eradicate poverty, preserve our planet, and promote peace and prosperity for all by 2030. The book engages the peculiar challenges and opportunities in the attainment of the goals for the wellbeing and prosperity of Africa and our country, Nigeria.

Meticulously organized into four sections, each of which tackles a critical aspect of the SDGs, section one of the volume examines a wide array of multidimensional policy initiatives that will not only help institutions and nations alleviate poverty, combat starvation and improve good health and well-being, but that will also promote quality education, engender gender equality, and make provision for clean water and sanitation. Section two explores issues critical to engendering prosperity, unpacking a range of discussions on sustainable consumption and production, economic growth, respectable work, and affordable energy. Next, section three engages the global environmental crisis and discusses the climate-focused counter-measures and goals aimed at combating climate change and global warming, further raising the ethical concerns relating to the need to preserve the human and nonhuman life forms. The last section examines the issues surrounding peace and partnerships, including the examination of robust institutional frameworks for promoting gender equality, inclusiveness, justice, and peace.

This publication emphasizes the practical insights and ideas that can help stakeholders harness the opportunities in, and effectively implement, the SDGs by 2030, provided stakeholders take seriously their shared responsibility to this global agenda. I therefore commend the contributors' scholarship and commitment to LASU-SDGs' initiative demonstrated in the ongoing intellectual conversations aimed at advancing the wellbeing of our people.

It is my wish that this book will inspire ideas that will stimulate further intellectual discussions and lead to stronger collaborations towards achieving sustainable development in Africa and beyond.

**Professor Ibiyemi Ibilola OLATUNJI-BELLO, mni, fnli, NPOM**

Vice Chancellor

Lagos State University

## PREFACE

The 2030 Agenda for Sustainable Development envisions a future that is economically sustainable, socially inclusive, and ecologically resilient. This vision is expressed in the 17 Sustainable Development Goals (SDGs), 169 targets, and 230 key performance indicators, all of which serve as a global call to action to end poverty, safeguard the environment, and promote peace and prosperity for everyone by 2030. The SDGs address a wide variety of linked social, economic, and environmental issues, emphasising the importance of a comprehensive and coordinated global effort.

However, as we approach the midpoint of 2030, development remains at danger. The 2030 Agenda's defining principle—"to leave no one behind"—represents a common commitment by all nations to keep human rights, well-being, and environmental sustainability at the forefront of development initiatives. Despite great progress in several areas, numerous difficulties remain, requiring quicker action, smart collaborations, and innovative solutions to realise the SDGs' full potential.

Recognising the importance of this objective, the Centre for the Actualisation of the United Nations Sustainable Development Goals at Lagos State University (LASU SDG Centre) organised the 2023 1st International Conference on Agenda 2030 and the SDGs to help with continuing sustainability efforts. The Centre is critical to promoting research, advocacy, and action to achieve the SDGs.

The LASU-SDG's statutory functions include: coordinating efforts to achieve the 17 SDGs aligned with the university's strategic vision, facilitating partnerships at local and international levels, and organising conferences, workshops, and policy dialogues to bridge academia, industry, and governance; Contributing to global sustainability knowledge through scholarly publications, books, and research journals, as evidenced by the Compendium; The Centre is dedicated to an integrated approach to sustainability that balances the social, environmental, and economic components while focussing on governance, academic quality, and resource mobilisation and it also aims to accelerate progress towards a more sustainable and equitable future for LASU, Nigeria, and the global community by forming strategic collaborations with government and international entities.

It was the 2023 1st International Conference on Agenda 2030 and the SDGs, which resulted in this compendium. It offers a critical discussion of the difficulties, developments, and possibilities connected with the SDGs, with a special emphasis on Nigeria and Africa. The book is structured into four topic sections, which covers all the seventeen SDGs:

Session One: People, focusses on SDGs 1–6 (No Poverty, Zero Hunger, Good Health and Well-being, Quality Education, Gender Equality, and Clean Water and Sanitation). Session Two: Prosperity, focusses on SDGs 7 (Affordable and Clean Energy), 8 (Decent Work and Economic Growth), 9 (Industry, Innovation, and Infrastructure), 10 (Reduced Inequalities), 11 (Sustainable Cities and Communities), and 12 (Responsible

Consumption and production).

Session Three: Planet, focusses on SDGs 13 (Climate Action), 14 (Life Below Water), and 15 (Life on Land), addressing important environmental challenges. Session Four: Peace & Partnerships, deals with SDGs 16 (Peace, Justice, and Strong Institutions) and 17 partnerships for the Goals), including governance, collaboration, and policy frameworks.

I invite researchers, policymakers, practitioners, and the general public to consider the insights, analyses, and suggestions given in this collection. The different contributions in this book demonstrate thorough research, critical thought, and a shared commitment to accomplishing the Sustainable Development Goals.

Thank you.

***Prof. Tayo Ajayi, PhD, MNIM, MNIT***

**Director,**

**(LASU-SDG)**

## PROLOGUE

“There is the need for accelerated efforts towards achieving the Sustainable Development Goals (SDGs). It is imperative that the 2030 agenda deadline of the SDGs must be achieved with no one left behind, otherwise it will become no more than a broken promise to the world's most vulnerable people. Despite these many challenges, Africa remains a continent of hope and Nigeria a country of hope, because the long-term structural endowments of Africa are strong. Africa also is the best investment proposition of the 21st century. Academia would have the opportunity to shape the design of solutions and policies that could have genuine social impacts and the outcomes from this 2023 conference will undoubtedly support collective rescue efforts of the Sustainable Development Goals”\*

*\*Culled from the speech of Mr. Matthias Schmale, United Nations Resident and Humanitarian Coordinator in Nigeria, at the National Conference on “Agenda 2030 and the SDGs” organized by the Lagos State University Centre for the Actualization of the UN Sustainable Development Goals (LASU-SDG), in collaboration with the United Nations Information Centre (UNIC), Abuja, on Monday, August 28<sup>th</sup>, 2023, in Lagos, Nigeria.*



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## ***SESSION ONE: FOCUS ON PEOPLE (SDG 1, 2, 3, 4, 5, and 6)***

### **1. Facilitating Mental Health Education of Children with Special Needs To Reduce Poverty And Foster Sustainable Development Goals**

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#### **Abstract**

Poverty and mental problems are intimately related to one another, those living in poverty are more likely to develop mental health problems leading to a downward spiral of economic marginalisation. Indeed, mental and psychosocial well-being is one of the most neglected areas in our country. People with mental health problems frequently experience stigma and discrimination which act as barriers to participation in social and economic activities. The sustainable development goal is to bring about a holistically healthy individual to engage in productive activities that enhance fulfilling relationships with others and display the capacity to adapt to change and cope with adversity. This paper focuses on mental health education for children with special needs, education for sustainable development goals, the effect of poverty on mental health, cognitive restructuring and positive mental health education, and parental roles in facilitating mental health education among children with special needs.

**Keywords:** Mental Health Education, Children with Special Needs, Sustainable Development Goals

#### **Introduction**

Mental, physical, and social health are essential and interconnected aspects of life. As our understanding of their relationship deepens, it becomes increasingly clear that mental health plays a vital role in the overall well-being of individuals, communities, and nations (World Health Organization, 2003). Mental health can be described as a state of well-being that allows people to recognize their potential, handle everyday challenges, work efficiently, and contribute positively to society. Unfortunately, in many parts of the world, mental health and mental illnesses do not receive the same level of attention or importance as physical health and are often overlooked or neglected (WHO, 2003).

Mental health is just as vital as physical health, yet individuals with disabilities often encounter obstacles in accessing mental health services. These challenges may include limited awareness, inexperience among healthcare providers, and transportation difficulties (Apigh.com). Recognising how disabilities affect mental well-being is crucial. People with disabilities face distinct stressors, such as stigma, discrimination, accessibility barriers, and struggles with daily activities (Alvarado Parkway Institute, 2022). These difficulties can result in feelings of isolation, frustration, and anxiety, which may develop into more severe mental health problems

The link between poverty and disability is well-recognized, as disability can both lead to and result from poverty (Mitra, Posarac, and Vick, 2013). Approximately 15 per cent of the world's population, around one billion

people—are estimated to live with disabilities. Poverty and disability are interconnected, often perpetuating each other. Factors such as poor health and nutrition, inadequate living conditions, limited access to healthcare, environmental hazards, and injuries among those in poverty can contribute to the development of disabilities. Similarly, the emergence of a disability can negatively impact education, employment opportunities, and income, while increasing living expenses, ultimately leading to higher poverty rates (Groce *et al.*, 2011; Mitra, Posarac, and Vick, 2013; WHO, 2011; Yeo and Moore, 2003). This paper focuses on Sustainable Development Goal 3, which emphasises ensuring healthy lives and promoting well-being for people of all ages. Health and well-being are essential throughout every stage of life, starting from the earliest years. This position paper aims to highlight how promoting mental health education for children with special needs can help alleviate poverty by enhancing their awareness and empowerment, ultimately advancing the achievement of sustainable development goals.

### **Mental Health Education of Children with Special Needs**

The brain, a vital part of the central nervous system located within the cranial cavity and protected by three membranes, is essential for thoughts and emotions (Romanes, 1986). Known as the seat of mental faculties, it is the body's most intricate organ. Like other organs, the brain can suffer from illnesses or disorders. When this happens, an individual may lose control of their mental functions, compromising their overall mental health. **Cicero (2018)** emphasised in *Grief of Mind* that mental illnesses are often more devastating than physical ones, as untreated mental health issues can become significantly more challenging than physical disabilities.

Children with visual impairments often encounter challenges that can lead to emotional disturbances. These difficulties may arise from various factors, including limited mobility (Kef, Hox, and Habekothe, 2000), feelings of loneliness (Hadidi and Al-Khateeb, 2013), fewer chances to develop social skills (Hatlen, 2004), and a higher level of dependence on others for assistance (Sacks, Kekelis, and Gaylord-Ross, 1992). Additionally, reduced participation in leisure activities can increase the likelihood of mood disorders in these children (Augestad & Jiang, 2015; Brunet, Flanders, and Augestad, 2015). Furthermore, they may struggle to anticipate others' behaviours and reactions due to difficulties in interpreting facial expressions of emotions (Pinquart and Pfeiffer, 2013). Promoting positive mental health and preventing mood disorders is essential for all children, including those with visual impairments (Grønmo and Augestad, 2007).

Hearing loss is closely linked to mental health challenges, largely due to the communication barriers it creates (Dalton, Cruickshanks, Klein, Wiley, and Nondahl, 2003). The inability to hear speech disrupts communication, significantly impacting relationships with close connections, such as family members and spouses. This difficulty has been associated with various negative outcomes, including reduced social interactions, mood disturbances, and dissatisfaction (Barker, Leighton, and Ferguson, 2017). Moreover, communication struggles can influence stress management strategies; for instance, avoidance behaviours, such as withdrawing from conversations, have been linked to the development of depression (Williams, Falkum, and Martinsen, 2015).

According to the World Health Organization (WHO), health is defined as a holistic state of physical, mental, and social well-being, not simply the absence of disease (WHO, 1947). Similarly, the European Network on Mental Health Policy describes health as a balance between the individual and their environment, emphasising that mental health is integral to overall health—there is no true health without mental well-being (Lahtinen, Lehtinen,

Riikoren and Ahon, 1999). Mental health, as defined by the WHO, is a state in which individuals recognise their potential, handle everyday stress effectively, work productively, and contribute to their community (WHO, 2005). It is considered a key dimension of overall health, ranging from optimal wellness to severe illness (WHO, 2013). Promoting mental health involves taking action to create supportive living environments and conditions that encourage mental well-being, enabling individuals, families, and communities to maintain healthy lifestyles, enhance emotional functioning, and foster social inclusion (O'Reilly *et al.*, 2018).

Mental health challenges can be categorized as either externalizing or internalizing problems (Boylan *et al.*, 2012; Stone *et al.*, 2015). Common externalizing issues, which can emerge as early as preschool, include disruptive behaviours, attention deficit hyperactivity disorder (ADHD), oppositional defiant disorder, and conduct disorder (Tremblay *et al.*, 2004). Internalizing disorders primarily consist of conditions such as depression, anxiety, panic disorder, mood disorders, social phobia, specific phobias, and obsessive-compulsive disorder (Baranne and Falissard, 2018; Ogundele, 2018). Over the past decade, there has been a notable increase in self-harm, suicide attempts, eating disorders, depression, and addictive behaviours among young people (Burstein *et al.*, 2019; Keyes *et al.*, 2019; Twenge, 2020; Twenge *et al.*, 2018).

### **Education for Sustainable Development Goals**

Given the current state of special needs education in Nigeria and its numerous challenges, there is a pressing need to focus on education for sustainable development (ESD). ESD is broadly defined as an approach to education that fosters changes in knowledge, skills, values, and attitudes to support the creation of a more equitable and sustainable society. Its goal is to empower and prepare both current and future generations to address their needs through a balanced integration of economic, social, and environmental aspects of sustainable development (Leicht, Heiss and Byun, 2018). Similarly, the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2014b) emphasises that ESD is a holistic and transformative form of education that encompasses learning content, outcomes, teaching methods, and the learning environment.

The adoption of the 2030 Agenda for Sustainable Development has undoubtedly revitalized efforts toward education for sustainable development (ESD), creating a favourable environment to expand its implementation (Leicht, Heiss and Byun, 2018). Central to this agenda is Sustainable Development Goal 4, which aspires to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (UN, 2015). Within this goal, one of the most ambitious and complex targets is Target 4. It seeks to ensure that by 2030, all learners gain the knowledge and skills necessary to foster sustainable lifestyles, uphold human rights, achieve gender equality, encourage a culture of peace and nonviolence, embrace global citizenship, and appreciate cultural diversity and the role of culture in sustainable development.

According to UNESCO (2015), education for sustainable development (ESD) involves integrating critical sustainability topics into teaching and learning, such as climate change, disaster risk reduction, biodiversity, poverty reduction, disabilities, and sustainable consumption. It also emphasizes participatory teaching methods that inspire and empower learners to adopt sustainable behaviours and act for sustainable development. As a result, ESD fosters essential skills such as critical thinking, envisioning future scenarios, and collaborative decision-making (United Nations Educational, Scientific and Cultural Organization, 2014b).

## **Effect of Poverty on Children's Mental Wellbeing**

Poverty extends beyond a lack of financial resources in families; it encompasses a shortage of essential assets such as emotional, mental, spiritual, and physical resources, support systems, role models, and knowledge (Boatwright and Midcalf, 2019). Financial resources are crucial for families to afford necessary goods and services. Poverty can also impact emotional regulation, particularly in how individuals handle difficult situations. Limited mental resources make it challenging to cope with the demands of daily life. Many students living in poverty lack most, if not all, of these critical resources, which are vital for being prepared to succeed in school (Boatwright and Midcalf, 2019).

Poverty is a significant issue, particularly for school-aged children, who often face numerous challenges impacting their education. Children living in poverty are more likely to attend school irregularly, achieve less academically, experience higher dropout or push-out rates, and suffer from poor health and inadequate nutrition (Shields, 2014). As a result, the social and academic disparity between children from high-income and low-income families continues to grow (Lancker and Parolin, 2020). Rice (2017) highlights that poverty in children can lead to poor educational outcomes, low future income, maternal depression, and negative behaviours. Furthermore, these children often receive little empathy from parents or caregivers, which in turn makes them less likely to show empathy toward their peers.

Research indicates that poverty has a significant impact on mental health, with physical and biological factors being the primary pathways through which this effect occurs (Simon, 2018). Environments where poverty is geographically concentrated, particularly in urban areas, are among the most detrimental to mental well-being. Individuals living in such conditions may exhibit social disorders as a consequence of poverty-induced mental health issues (Simon, 2018). Murali and Oyeboode (2004) support Simon's findings, noting that psychiatric conditions are more prevalent in poverty-stricken areas. However, they emphasize that a lack of financial resources does not directly cause mental health issues. Instead, poverty can act as both a contributing factor to and a consequence of poor mental health, leading to conditions such as emotional disturbances, anxiety, obsessive-compulsive disorders, and depression (Murali and Oyeboode, 2004).

Poverty is devastating in any form, but child poverty is particularly heartbreaking. Children are the most vulnerable, facing risks such as malnutrition, disease, abuse, and exploitation. The impact of poverty on children is profound, often stunting their physical and mental development, shortening their life expectancy, and trapping them in cycles of hardship.

Poverty prevents individuals from achieving their full potential, whether in the United States or the world's poorest nations. It represents a persistent state of deprivation in one or more essential aspects of a grave injustice. Poverty denies sufficiency, causing suffering, impeding progress, and creating a ripple effect of brokenness that impacts individuals, families, communities, and the global society.

Poverty can have profound and lasting effects on children's psychological and physical development. Malnutrition and insufficient healthcare during early childhood often result in severe consequences for their growth and overall well-being (Brooks-Gunn & Duncan, 1997; Nandy *et al.*, 2005; Seccombe, 2000; Simich, 2006). Factors such as protein-energy malnutrition leading to structural brain abnormalities, deficiencies in essential dietary micronutrients, exposure to environmental toxins, lack of early sensory stimulation, anaemia caused by parasitic infections, and complications from infectious diseases contribute to the higher rates of

neurodevelopmental disabilities and lower educational outcomes observed among children experiencing extreme poverty (Bergen, 2008).

A significant amount of research on the effects of child poverty on mental health has focused on children in developed countries who experience relative poverty and social deprivation. The findings suggest that poverty raises the likelihood of behavioural and emotional issues in children and may also have long-term negative effects on mental health in adolescence and adulthood. For instance, a study involving 5,000 low-income families across 20 large cities in the U.S. found that homelessness or unstable housing was linked to higher levels of both internalizing and externalizing problems in three-year-old children compared to those in more stable housing situations (Park et al., 2011).

### **Cognitive Restructuring and Positive Mental Health Education**

Positive mental health is inherently valuable. Individuals with strong mental health typically exhibit positive emotions and personality traits, which serve as valuable resources. They often possess high self-esteem, a strong sense of mastery, coherence (experiencing life as meaningful and manageable), and self-efficacy. This concept can be viewed as an individual's capacity to handle adversity effectively and avoid breakdowns or health challenges when faced with difficult circumstances. For children with special needs, rebuilding confidence and fostering an intrinsic drive for achievement is crucial. Therefore, it becomes essential to explore whether cognitive structuring can enhance positive mental health, contributing to the attainment of sustainable development goals.

Cognitive restructuring is a method aimed at challenging and correcting cognitive distortions or flawed patterns of thinking, intending to replace irrational, counterproductive beliefs with more accurate and constructive ones (Au, Chan, Li, Leung, Li, and Chan, as cited in Akaneme, 2012). Joseph (2003) describes cognitive restructuring as a technique that empowers individuals to better manage their thoughts, emotions, and behaviours. It involves learning to think in new ways by transforming faulty thought patterns into more rational, realistic, and positive ones. Similarly, Ekeh and Obi (2012) define cognitive restructuring as the process of substituting distorted thoughts with more logical, accurate, and practical ones. The approach focuses on helping individuals gain greater control over their mental and emotional states, rather than eradicating all negative feelings.

In this paper, cognitive restructuring is described as a process aimed at helping individuals address and correct negative or flawed beliefs about a particular task, which may hinder their ability to perform well. Wolpe (1996) explains cognitive restructuring as the practice of learning to think in new ways by replacing faulty, irrational thought patterns with more rational, realistic, and positive ones. The core steps involved in cognitive restructuring include identifying the thoughts and beliefs that contribute to negative emotions, assessing their accuracy and relevance using logic and evidence, and, if necessary, modifying or replacing distorted thoughts with more accurate and constructive alternatives.

The fundamental principle behind cognitive restructuring is that individuals' emotions and behaviours are significantly influenced by their self-talk and mental imagery. By altering these, they can enhance their happiness, kindness, and productivity, and achieve various positive outcomes (Beck, 1999). Consequently, cognitive restructuring is considered an effective tool for fostering achievement-oriented behaviour, which can contribute to the realization of sustainable development goals.



## Parental Roles in Facilitating Mental Health among Children with Special Needs

Mental health is a crucial component of overall health and well-being. Parents play an essential role in fostering mental health among children with special needs, which can contribute to reducing poverty.

1. Providing nurturing and loving care establishes a strong foundation for children with special needs, enabling them to develop the social and emotional skills necessary for leading happy, healthy, and fulfilling lives.
2. A mentally healthy child with special needs is better equipped to handle stress in various situations, whether attending school, playing at home, or interacting in the community, without feelings of anger, anxiety, or depression. Sound mental health during childhood is essential for their growth and achieving their full potential.
3. Parents should encourage children with special needs to learn new activities, such as games, to foster curiosity and engagement with their surroundings. Allowing them to explore and play safely, while offering reassurance through smiles and conversations, helps build their self-confidence and self-esteem.
4. Parents have a responsibility to guide children with special needs in setting realistic goals aligned with their ambitions and choosing activities that challenge their abilities, ultimately boosting their self-confidence.
5. Parents must provide guidance and constructive discipline, allowing children with special needs opportunities to explore, develop new skills, and gain independence. At the same time, children should understand that certain behaviors are unacceptable and that they are accountable for their actions. Parents must model self-control and self-discipline, as these behaviors cannot be expected from children if they are not demonstrated by caregivers.

### Conclusion

The Nigerian government is making concerted efforts to tackle poverty and its associated impacts, particularly on children with special needs. This aligns with the recognition of 2021–2030 as the United Nations Decade of Action for accelerating the achievement of the Sustainable Development Goals (SDGs). This paper highlights the importance of mental health education for children with special needs, the role of education in achieving the SDGs, the effects of poverty on children's mental health, the significance of cognitive restructuring for fostering positive mental health, and the critical role of parents in promoting mental well-being.

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## 2. Assessment of Air Pollutant Variation in Selected Residential Areas of Lagos State, Nigeria

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### **Abstract**

The study examined variations in air pollutants across residential areas in Lagos State and identified the spatial distributions of pollutants as well as the seasonal variations in air quality characteristics. Data was gathered using primary and secondary sources. The secondary data covered air pollutants (CO and O<sub>3</sub>) from 1980 to 2022 and NO<sub>2</sub> and SO<sub>2</sub> from 2005 to 2022 across residential areas. Data obtained was analyzed using ANOVA, stepwise multiple regression and PCA. The result revealed that seasonal variation in air pollutants showed that the contents of CO and NO<sub>2</sub> were high in the dry season, while those of O<sub>3</sub> and SO<sub>2</sub> were high in the wet season. Air pollutants were also observed to be higher in the morning than in the evening across the residential area. Results of PCA identified anthropogenic activities across the two residential areas responsible for the emission of PM and CO. In the high and low residential areas, only temperature was significantly positive and explained 30.8% and 31.3% of the variation (increase) in CO<sub>2</sub>. In the high residential area, a positive and significant association was observed between temperature and CO<sub>2</sub> ( $\rho = 0.579, p < 0.05$ ); a negative association existed between wind and CO<sub>2</sub> ( $\rho = -0.627, p < 0.05$ ), while in the low-density areas, a positive and significant association was observed between temperature and CO<sub>2</sub> ( $\rho = 0.610, p < 0.05$ ). Based on the findings, the study suggested that the road network should be rehabilitated and widened to accommodate the increasing volume of vehicular traffic. In addition, afforestation should be encouraged, to serve as a carbon sink along the major highway roads, to achieve Sustainable Development Goals (SDG 9 & SDG11).

**Keywords:** *Air Pollutants, Particulate matter (PM), Residential, Variation.*

### **Introduction**

Urban air pollution has become an issue of serious environmental concern. The threat posed on human life, living organisms and property makes it mandatory to devise control measures to combat it. This can only be achieved by establishing reliable information about the source-receptor relationship of the pollutants (Oluyemi and Asubiojo, 2001; Adejobi, 2020).

The man might survive weeks without food and days without water, but he can only last a few seconds without clean air. An average person breathes over 3,000 gallons of air each day. The World Health Organisation (WHO, 2018). What happens when the air is polluted? Air or tropospheric- pollution can make breathing difficult. Children and senior citizens are especially vulnerable, but anyone who inhales deeply can suffer asthma attacks, coughing and wheezing, and shortness of breath (Raheem and Adekola, 2009; Magaji and Hassan, 2015).

In Nigeria, air pollution has affected the local weather conditions. This is apparent in the change in the duration and intensity of rainy, harmattan and dry seasons. Recently, the heat emissions of the sun have become rather scorching, and experts believe it is due to the depletion of the protective ozone layer. The warming effect that results from this phenomenon could affect significantly the comfort and the livability of the urban people

(Ukemenam, 2014). Also, the distribution and abundance of particulate matter is responsible for local rainfall patterns and hence there is a significant increase in precipitation in and around cities and is due to air pollution. Air pollution causes weather to change on a continental or global basis. According to modern environmentalists, increasing particulate matter pollution may reduce the amount of sunlight reaching the surface of the earth thereby lowering solar radiation energy at the earth's surface (Adejobi,2020).

Air pollution arising essentially from anthropogenic activities constitutes a serious environmental problem. Atmospheric pollution has emerged as a problem in most African countries only in the past few decades, its severity and impacts are still largely unknown, although it is believed that gaseous pollutants and acid rain have adversely affected vegetation, soils and water in some areas.

There is burgeoning literature that shows that air pollutants have several consequences on the environment and its effect is manifested in man and living organisms. Literature shows that air pollution can contribute to increase in hospital admission, lead to absence from work and school, increase in mortality rate (Giri et al., 2006; Hopke, 2009); for animals, there are the problems of mottled teeth and condition of the joints known as exostosis leading to lameness and ultimate death (Han and Naeher; 2006) and for vegetations, gaseous pollutants are reported to cause destruction of the chlorophyll and photosynthetic activity which untimely leads to death of plant (Qi, et al., 2000).

In the case of atmospheric properties, air pollutants cause visibility reduction which may lead to safety hazards, fog formation and precipitation, solar radiation reduction and alteration in temperatures and wind distribution (Chow et al., 2002; Watson, 2002; Cao et al., 2004).

Despite this, the atmospheric chemistry of the tropics has not been adequately studied in the past, placing our current understanding in doubt. Air pollution in Nigeria and across the globe is not a new phenomenon and several scholars have attempted to examine the concentration of pollutants and their effect on our environment. In Nigeria, empirical studies have been carried out on the spatial pattern of microclimatic variables, energy distribution in urban centres, thermal responses, comparative study of urban heat island syndrome within the urban canopy (Efe, 2006; Oke, 2004) and biomonitoring of air quality (Ogunsola et al.,1993; Odukoya et al., 2000; Obioh et al., 2005).

However, in all these studies, the spatial and temporal variation in ambient air quality across residential density areas has not been adequately studied and documented. This is because the majority of the studies simply categorize and establish patterns in ambient air quality across selected land uses between urban-rural gradients or divides. Also, the present study contributes to the literature by introducing a different methodological approach in the collection of air quality data. Instead of relying on the usual conventional method of collecting air quality data directly from the field via the use of standard equipment, the present study used remote sensing techniques to generate air quality data, which is indeed specific, more precise and convenient. Satellite data are more accurate and reflect area-specific conditions. Such data enable the trend (increase or decrease) in air quality to be established over time which enables area-specific air quality monitoring to be carried out (Adejobi, 2020). The study of ambient air quality across residential density areas is worthwhile in the understanding of the pattern and variability in air quality assessment concerning diverse anthropogenic activities which are site-or-area specific

and can have immense impacts on air quality concentration. Based, however, on the argument above, the present study therefore empirically assessed the spatial variation in ambient air quality across three residential areas in Lagos State, Nigeria. So that the achievement of United Nations SDG goals 9 & 11 can be met by developing sustainable, [resilient](#) and inclusive infrastructures; promoting inclusive and sustainable industrialization, lower carbon emissions, and renew and plan cities that offer opportunities for all with access to basic services ,while reducing resource use and environmental impacts..

## **Materials and methods**

### **Study area**

The study area is Lagos State. Lagos State is in the coastal region along the southwest corner of the country; it experiences a high density of rainfall all year round. The daily temperature is high and ranges between 25 to 32°C. Rainfall is prominent between March and October every year. The topography is flat and undulating. The structure of the terrain and slope of the city has serious consequences on the flow of water and aids flooding (Odumosu et al.,1999). Lagos State is one of the fifteen largest population agglomerations in the world. Lagos State the commercial hub of Nigeria with heavy vehicular movement and traffic which could affect ambient air quality.

### **Methodology**

#### **Research design**

The experimental and historical research designs were employed in the process of data gathering. Experiment design enabled answers on 'how' and 'why' air quality varied across residential density types to be examined. On the other hand, historical research enabled events that happened in the past to be used to explain situations in the present (Singh, 2006 cited Adejobi, 2020). Yearly air quality data over 14 and 39 years were obtained through this approach. These two research designs were ideal for the present study because they enabled quantitative data to be collected to provide explanations for the variation in ambient air quality across residential density areas.

#### **Data types and sources**

The study collected diurnal (daily) air pollutants (CO, CO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub>) data across residential density areas in Lagos state; and data on seasonal air pollutants (NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>, and CO) across residential land uses. Diurnal (daily) air quality parameters were obtained or sourced basically from physical measurements, i.e. field experiments using standardized equipment. Data on CO, CO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> were collected from identified points across residential density areas (high, medium and low) in Lagos State using Minivol Portable Air Sampler. The set of secondary data on NO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>, and CO for 14 and 39 years was collected from Satellite data actively assimilated in the ERA-Interim reanalysis. These contain profile (PROF), total column (TC), partial column (PC) and tropospheric column (TRC) data sets.

### **Sampling**

Sampling was carried out in two ways. Residential areas for diurnal (daily) air pollutants were ascertained and sampled using stratified and random sampling techniques. a, stratified sampling technique was used to classify the study area (Lagos State) into homogenous groups with similar characteristics, which is high-density,

medium-density and low-density residential areas. In the second stage, settlements that fall within these residential classifications were identified and grouped. In the high-residential density area, 113 streets were identified out of which 16 streets were randomly selected for data collection. In the medium-residential density area, 39 streets were identified out of which 13 streets were randomly selected, while in low-density area, 33 streets were identified from which 12 streets were randomly selected. This process enabled air quality data to be collected across varied residential areas (Adejobi, 2020).

Diurnal air pollutants ( $\text{CO}$ ,  $\text{CO}_2$ ,  $\text{M}_{2.5}$  and  $\text{PM}_{10}$ ) were collected in each street in the morning between 10 – 11 am and in the evening between 5pm with the help of field assistants positioned at different streets. The data collection period spanned over two months, which enabled air quality data to be collected across the three residential density areas. In addition, secondary data on  $\text{NO}_2$ ,  $\text{SO}_2$ ,  $\text{O}_3$ , and  $\text{CO}$  for 14 and 39 years collected using a satellite approach were generated for three locations that depicted the three residential density zones. For the high-density residential area, Agege was used, in the medium-density residential area, Oworonshoki was used, while in the low-density residential area, Victoria Island was used. These three locations were chosen because of the diverse human activities prevalent in them which are believed to contribute to ambient air pollutants over time.

### **Secondary data collection**

For secondary data, satellite data were used in the reanalysis of greenhouse gas (GHG) datasets actively assimilated in the ERA-Interim reanalysis to constrain the reactive gases. These contain profile (PROF), total column (TC), partial column (PC) and tropospheric column (TRC) data sets. The data were archived in the ECMWF data archive (MARS) and a pertinent subset of the data, interpolated to a regular latitude/longitude grid. The ERA5 dataset contains one (31 km) high resolution realization (HRES) and a reduced resolution ten-member ensemble (EDA). Generally, the data are available at a sub-daily and monthly frequency and consist of analyses and short (18-hour) forecasts, initialized twice daily from analyses at 06 and 18 UTC. Most analyzed parameters are also available from the forecasts. There are forecast parameters, e.g. mean rates and accumulations that are not available from the analyses. The prevailing large uncertainty involved in GHG flux estimates for over the study area, essentially due to the paucity of available data, is coupled with a poor understanding of underlying processes, both of which preclude gauging of future fluxes in response to human pressures and anthropogenic activities.

### **Method of data analysis**

Data obtained were analyzed with the aid of means and ANOVA. One-way analysis of Variance Test (ANOVA) enables us to make the comparison between the mean variations in the diurnal air quality parameters across different residential areas.

## **Results and Discussion**

### **Seasonal variation in air quality in the high-density residential area**

In the high-density residential area, the concentration of ambient air pollutants varied across the months and seasons. The results in Table 1 and Figure 1 showed that a high concentration of  $\text{CO}$  was recorded in the dry

season, precisely in January and December with values of 326.6ppm and 325.4ppm respectively, while low concentration was observed in April and March representing the wet season with values of 177.5ppm and 194.4ppm respectively. For NO<sub>2</sub>, high content was recorded in January and December with values of 261.5ppm and 255.6ppm respectively and low in August followed by September with values of 97.6ppm and 98.8ppm respectively. In addition, O<sub>3</sub> concentration was high in July (272.7ppm), followed by August (271.2ppm) and low in January (249.2ppm) followed by February (250.5ppm). The study also showed that SO<sub>2</sub> contents in the high-density residential zone were high in August (0.13ppm) followed by July (0.12ppm) and low values of SO<sub>2</sub> were recorded in January (0.00ppm) and April/May (0.01ppm).

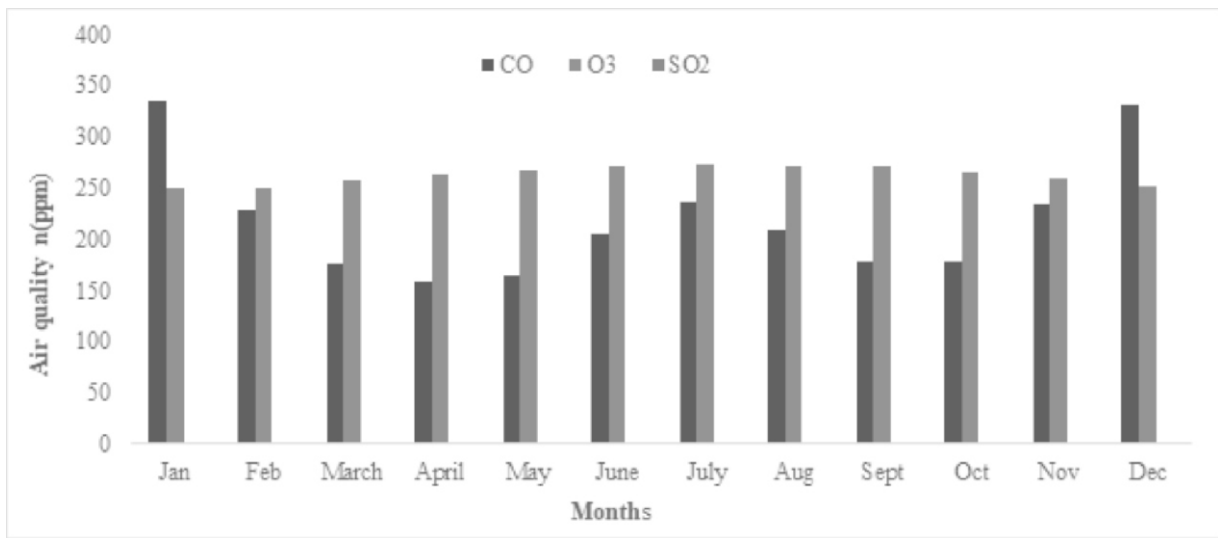


Fig. 1. Monthly ambient air quality in the high density residential zone

Table 1. Seasonal variation in air quality in the high density area

Seasons	Months	Air pollutants			
		CO (ppm)	NO <sub>2</sub> (ppm)	O <sub>3</sub> (ppm)	SO <sub>2</sub> (ppm)
Dry	Jan	326.6	261.5	249.2	0.00
	Feb	241.6	104.2	250.5	0.01
	Mar	177.5	107.5	255.6	0.01
	Apr	158.8	107.5	261.5	0.01
	Dec	325.4	255.6	249.2	0.01
	<b>Total</b>	<b>1146.9</b>	<b>807.3</b>	<b>1011.6</b>	<b>0.06</b>



Wet season	March	194.4	145.0	257.1	0.02
	April	177.5	118.8	264.4	0.01
	May	185.4	115.7	267.6	0.01
	June	229.0	114.5	271.0	0.04
	July	258.7	93.6	272.7	0.12
	Aug	228.8	97.6	272.2	0.13
	Sept	200.4	98.8	271.5	0.11
	Oct	203.2	132.1	266.0	0.06
	<b>Total</b>	<b>1677.4</b>	<b>916.1</b>	<b>2142.5</b>	<b>0.5</b>

### Seasonal variation in air quality in the medium-density residential area

The results in Table 2 and Fig 2 showed that a high concentration of CO was recorded in January (331.2ppm) followed closely by December (328.3ppm), while low concentration of CO was observed in April and May with values of 168.3ppm and 175.1ppm respectively. The high content of NO<sub>2</sub> was recorded in January followed by December with values of 320.6ppm and 315.4ppm respectively and low in August (117.1ppm) followed by July with a value of 131.4ppm. The content of O<sub>3</sub> was high in July (273.0ppm), followed by August (272.6ppm) and low in January followed by February with values of 249.8ppm and 251.0ppm respectively.

In addition, SO<sub>2</sub> contents were high in August (0.12ppm) followed by September (0.10ppm) and low in January and February with values of 0.01ppm. The result presented in Table 2.2 identifies January as the month with high concentrations of CO and NO<sub>2</sub>, while O<sub>3</sub> and SO<sub>2</sub> are high in July and August respectively. This means that CO and NO<sub>2</sub> are high in the dry season, while O<sub>3</sub> and SO<sub>2</sub> are high in the wet season. This result shows a similar pattern with the high-density residential zone and the possible reason is that air pollutants are controlled by wind and as such could be carried from one location to the other. Another reason is that the residential areas are contiguous, as such they are influenced by similar environmental conditions.

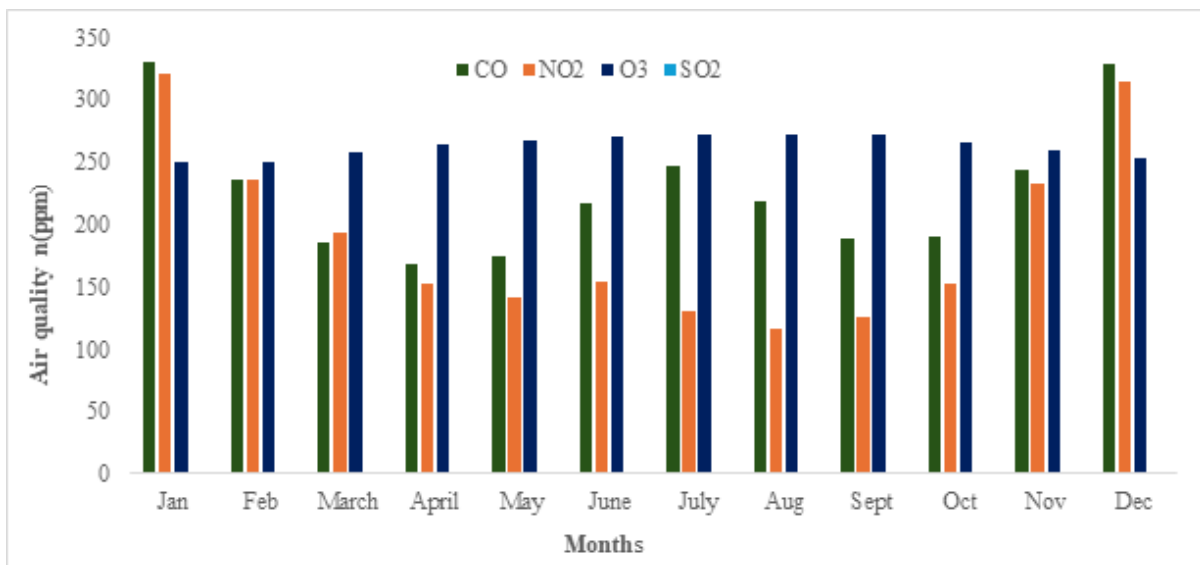


Fig 2: Monthly ambient air quality in the high-density residential zone

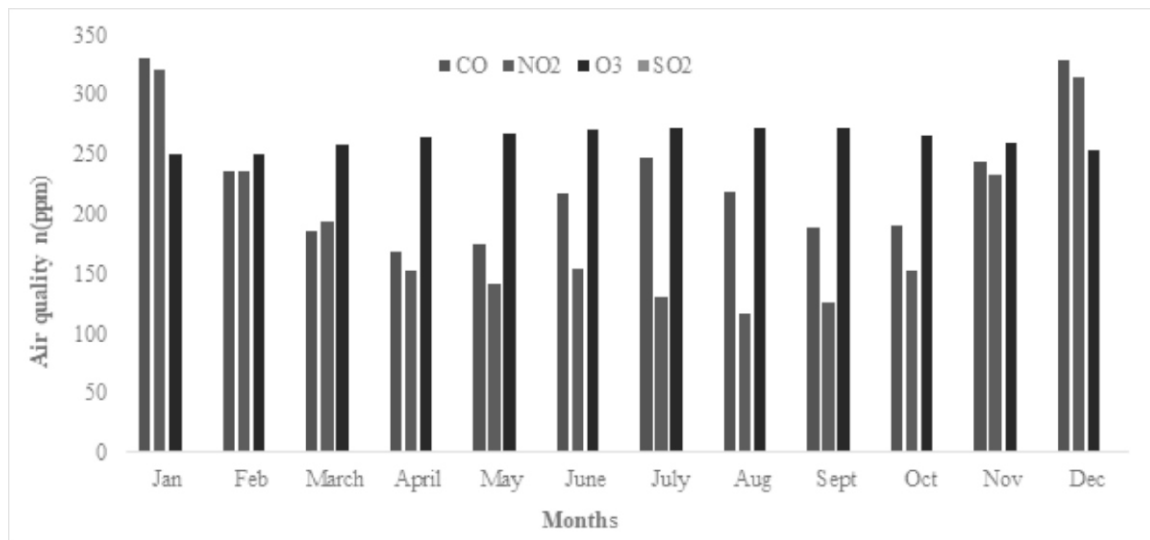
**Table 2: Seasonal variation in air quality in the medium-density area**

Seasons	Months	Air pollutants			
		CO (ppm)	NO <sub>2</sub> (ppm)	O <sub>3</sub> (ppm)	SO <sub>2</sub> (ppm)
Dry	Jan	331.2	320.6	249.8	0.00
	Feb	235.4	236.7	251.0	0.00
	Nov	243.5	233.0	259.8	0.01
	Dec	328.3	315.4	253.1	0.04
	<b>Total</b>	<b>1138.4</b>	<b>1105.7</b>	<b>1013.7</b>	<b>0.05</b>
Wet season	March	185.1	193.6	257.6	0.02
	April	168.3	152.6	264.9	0.05
	May	175.1	141.7	268.1	0.01
	June	217.2	154.2	271.4	0.05
	July	247.7	131.4	273.0	0.06
	Aug	219.3	117.1	272.6	0.12
	Sept	189.3	126.5	271.9	0.10
	Oct	191.2	152.1	266.4	0.08
	<b>Total</b>	<b>1593.2</b>	<b>1169.2</b>	<b>2145.9</b>	<b>0.49</b>

### Seasonal variation in air quality in the low-density residential area

The results in Table 3 and Fig 3 showed that a high concentration of CO in the low-density residential zone was recorded in January (335.7ppm) followed closely by December (331.0ppm), while a low concentration of CO was observed in April (159.0ppm) and May (164.7ppm). The high content of NO<sub>2</sub> was recorded in January (244.6ppm) followed by December (216.3ppm) and low in May (102.3ppm) followed by August (103.9ppm). The content of O<sub>3</sub> was high in July (272.3ppm), followed by August (271.9ppm) and low in January followed by February with values of 249.1ppm and 250.4ppm respectively. SO<sub>2</sub> contents were high in September (0.15ppm) followed by October (0.09ppm) and low in January and November with values of 0.00ppm.

The result in Table 3.3 identifies January as the month with high concentration of CO and NO<sub>2</sub>, while O<sub>3</sub> and SO<sub>2</sub> are high in July and September respectively. This means that CO is high in the dry season, while O<sub>3</sub> and SO<sub>2</sub> are high in the wet season.

**Fig 3: Monthly ambient air quality in the high-density residential zone**

**Table 3: Seasonal variation in air quality in the low-density area**

Seasons	Months	Air pollutants			
		CO (ppm)	NO <sub>2</sub> (ppm)	O <sub>3</sub> (ppm)	SO <sub>2</sub> (ppm)
Dry	Jan	335.7	244.6	249.1	0.00
	Feb	229.3	183.8	250.4	0.01
	Nov	233.7	146.7	259.1	0.00
	Dec	331.0	216.3	252.5	0.04
	<b>Total</b>	<b>1129.7</b>	<b>791.4</b>	<b>1011.1</b>	<b>0.05</b>
Wet season	March	175.7	155.9	257.0	0.01
	April	159.0	116.2	264.3	0.04
	May	164.7	102.3	267.5	0.01
	June	205.3	120.6	270.8	0.07
	July	236.7	115.7	272.3	0.07
	Aug	209.8	103.9	271.9	0.09
	Sept	178.3	106.8	271.2	0.15
	Oct	179.2	113.9	265.7	0.09
	<b>Total</b>	<b>1508.7</b>	<b>935.3</b>	<b>2140.7</b>	<b>0.53</b>

### Spatial variation in air pollutants (CO) across residential density zones

The content of CO in the high-density area ranged from 0.00 to 26.5ppm with high values recorded in Gowon Estate and Oshodi of 26.5 and 14.5ppm respectively; in the medium-density residential area, CO levels ranged from 0 to 10ppm with high value observed in Ikorodu/ Ayangbure Road, while in other areas, it was not detected. In addition, in the low-residential density area, CO content ranged from 0 to 4ppm with high values recorded in Oniru Estate VI and Ikoyi GRA (Fig:4.1). The ranges of CO recorded in 90% of the locations in the high-density zone and medium and low-residential zones are within the 10ppm recommended by FEPA (Atubi, 2015; Ebong and Mkpenie, 2016).

However, in Gowon Estate and Oshodi, the CO levels are above the FEPA recommended threshold. This suggests that high emissions of CO are generated in these areas. However, the range reported in the medium and low-density residential areas tends to fall with the range of 1.83 to 2.17ppm obtained by Magaji and Hassan (2015) but falls below the range of 30 - 70ppm reported in Lagos by Adelagun et al., (2012). The concentration of CO in medium and low-density residential areas is within the 10ppm recommended by FEPA (Atubi, 2015; Ebong and Mkpenie, 2016) and within the WHO permissible limit of 25ppm (Obanya, Amaeze, Togunde *et al.*, 2018). The content of CO is however within the National Institute for Occupational Safety and Health (NIOSH) recommended limit of 200 ppm (NIOSH, 1992 cited in EPA, 2016). Like particulate matter (PM), high concentrations of carbon monoxide (CO) is recorded in the high-density residential area. This is expected as the area has a high concentration of CO due to heavy traffic congestion, and residential and industrial activities prevalent in the area. This agrees with the report of the Scottish Environmental Protection Agency (2019) which stated that high content of CO is usually found in areas with high traffic density. Other man-made sources of CO are power stations and waste incinerators Scottish Environmental Protection Agency (2019).

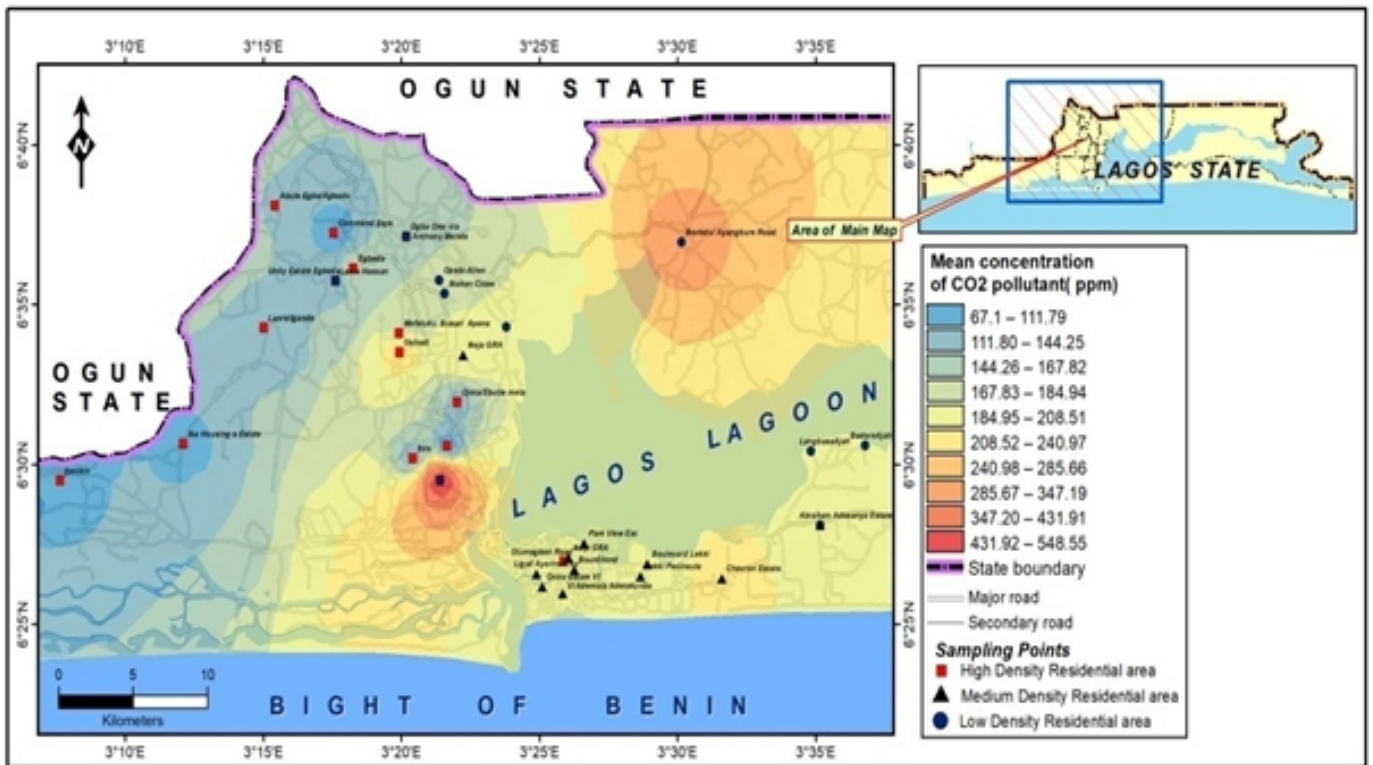
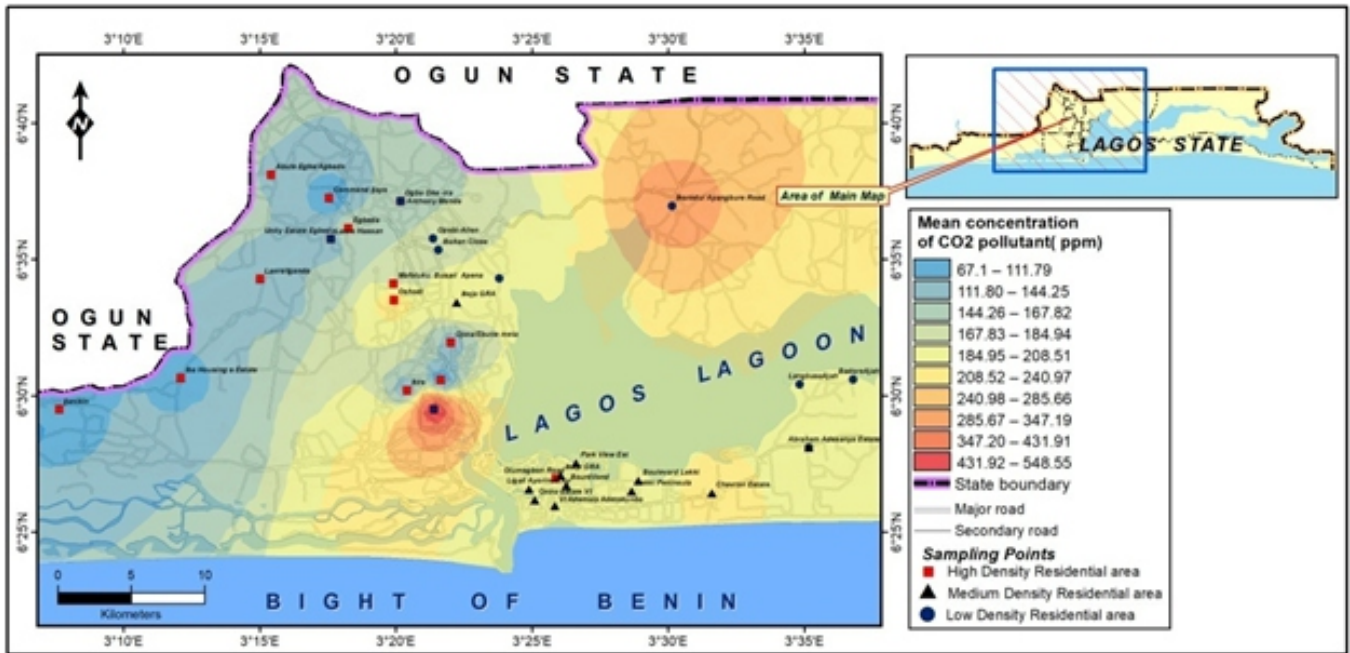


Fig 4.1: Showing the distribution of CO Pollutants in High, Medium and Low residential areas.

In addition, the concentration of carbon dioxide ( $\text{CO}_2$ ) varied across the three residential areas and locations.  $\text{CO}_2$  values in the high-density residential area ranged from 67.1 to 974.6ppm with high and low content recorded in Cooperative Villa and Command Ijaye respectively. In the medium-residential density area,  $\text{CO}_2$  content ranged from 150 to 313.5ppm with Unity Estate Egbeda and Ikorodu/ Ayangbure Road recorded high and low concentrations respectively. In the low-residential density area,  $\text{CO}_2$  content ranged from 166.5 to 227ppm with Chevron Estate and Ikoyi GRA recording high and low concentrations respectively (Fig 4.1). The range of  $\text{CO}_2$  recorded in the three residential areas is far below WHO WHO-stipulated maximum value of 20,000ppm (Abamand Unachukwu, 2009). The  $\text{CO}_2$  values recorded in the three residential areas fall far below the value of 96,280.8 ppm reported in 2016 by the World Bank (2018). High concentrations of  $\text{CO}_2$  have also been reported across cities in Nigeria by Okhimamhe and Okelola (2013). Okhimamhe and Okelola (2013) recorded a high  $\text{CO}_2$  emission value of 3236ppm at Suleja, 3043.5ppm at Minna and 3036ppm at Bida. In Nigeria, the problem of air pollution is acknowledged to be caused mainly by the gas-flaring, exhausts of automobiles and diesel power generators (Nwadinigwe, 2015). As expected,  $\text{CO}_2$  content is high in the high-density residential zone and low in the low-density residential area. This result agrees with the finding of Akpan and Ndoke (1999) in Northern Nigeria where high concentrations of  $\text{CO}_2$  was reported in heavily congested areas. Environmental Protection Agency (2019) attributed  $\text{CO}_2$  to fossil fuels burned for heat, the use of certain products that contain greenhouse gases, and the handling of waste and burning fossil fuel for our cars, trucks, ships, trains, and planes.



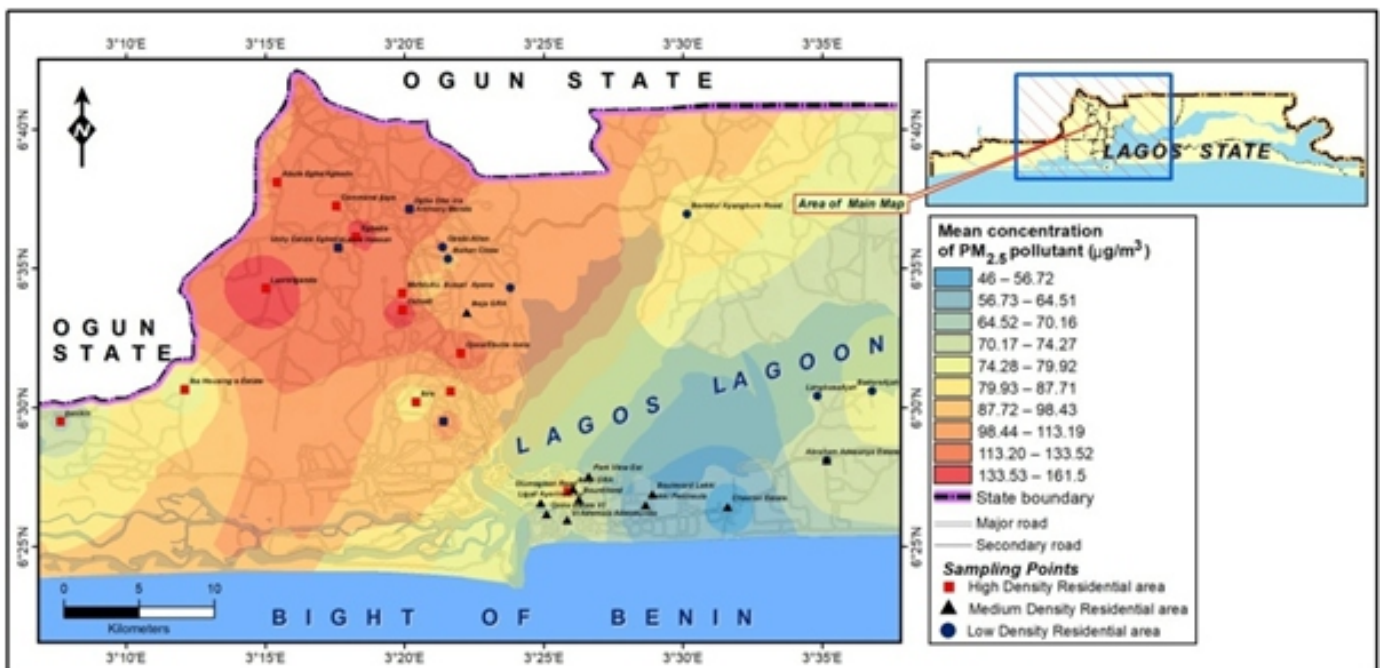
**Figure 4.2 : Showing the distribution of Co<sub>2</sub> Pollutant in high. Medium & low residential areas.**

Fig: 4.2 shows the concentration of air quality in the residential density zones in Lagos State. It also shows air quality across the three residential density zones and the selected locations in the area. The result shows clear variation in the concentration of air quality. PM<sub>2.5</sub> contents in the high-density residential area ranged from 69.5 to 161.5 µg/m<sup>3</sup>, with high and low values recorded in Ijanikin and Lanre/Igando with values of 69.5 and 161.5 µg/m<sup>3</sup> respectively. In the medium-density residential zone it, PM<sub>2.5</sub> ranged from 64 to 139.5 µg/m<sup>3</sup> with high and low values recorded in Agege/Oko-oba (Omotoye Street) and Ojokoro/Ijaye (Onitiri Street) respectively, while in the low-density residential zone, PM<sub>2.5</sub> ranged from 46 to 102 µg/m<sup>3</sup> with high and low values recorded in Lekki Peninsula (Admiralty Close) and Ikeja GRA respectively.

The range of PM<sub>2.5</sub> recorded across the residential zones are within the threshold of 250 µg/m<sup>3</sup> recommended by FEPA (Obanya, Amaeze, Togunde et al., 2018). The range however falls with the range of 146 to 238 reported in Lagos State by Obioh, Olise, Owoade et al., (2005). The values are also within the range of 5 to 462 µg/m<sup>3</sup> reported in Lagos by Offor, Adie and Ana (2016). The results obtained mean that the high-density residential zones have increased concentrations of PM<sub>2.5</sub> followed by the medium-density residential zone and the low-density residential zone. The high PM<sub>2.5</sub> recorded in the high-density area is expected as the area experiences high fuel combustion from automobiles and commercial activities resulting in the release of matter (Han, 2010; USAID, 2012). The result also identifies Lanre/Igando, Oshodi, Egbeda and Ojota as areas in the high-density residential area with high concentrations of PM<sub>2.5</sub>.

In addition, the concentration of PM<sub>10</sub> in the high-density residential area ranged from 87 to 220.5 µg/m<sup>3</sup>, with high and low values recorded in Ijanikin and Lanre/Igando respectively. In the medium-density residential zone it, PM<sub>10</sub> ranged from 88 to 157.5 µg/m<sup>3</sup> with high and low values recorded in Abraham Adesanya Estate and Opebi-Allen (Wole Ogunjimi) respectively, while in the low-density residential zone, PM<sub>10</sub> ranged from 80 to 139.5 µg/m<sup>3</sup> with high and low values recorded in Ikoyi Thompson Ave and Ikeja GRA respectively (Fig 4.2). The

range of PM<sub>10</sub> recorded across the residential zones is within the threshold of 250µg/m<sup>3</sup> recommended by FEPA (Obanya et al., 2018). The range, however, falls with the range of 146 to 238 reported in Lagos State by Obiohet al., (2005). The values are also within the range 41.6 to 326.8µg/m<sup>3</sup> reported in Lagos by Offor, Adieand Ana (2016). The results show that the high-density residential zones have increased concentration of PM<sub>10</sub> followed by the medium-density residential zone and the low-density residential zone. The high PM<sub>10</sub> in the high-density area as usual is attributed to increased level of automobile combustion and dust in the area. These conditions can increase PM content. Similar reasons for automobile combustion, dust, cooking and incomplete combustion are given by USAID (2012) for high PM<sub>10</sub> in urban areas. The result also identifies Lanre/Igando, Oshodi, Egbeda and Ojotaas areas in the high-density residential area with high concentration of PM<sub>2.5</sub>.



**Fig:4.3** Showing the distribution of PM<sub>2.5</sub> air pollutants in high, medium & low residential density areas.

**Table 4: Summary of ANOVA result of the variation in air quality across residential areas**

Parameters	Mean values			F-values	Sig
	High-density	Medium-density	Low-density		
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	113.66	92.83	71.27	11.403*	0.000
PM <sub>10</sub> (µg/m <sup>3</sup> )	153.66	125.79	97.50	10.471*	0.000
CO (ppm)	2.72	1.00	0.77	0.700 ns	0.503
CO <sub>2</sub> (ppm)	179.54	192.97	203.74	0.110 ns	0.896

\*Significant at 5% alpha level; ns = not significant at 5% alpha level

The result obtained in Table 4. showed that air pollutants vary over space and time. It showed that there is a significant variation in  $PM_{2.5}$  contents across residential areas in Lagos State ( $F = 11.403$ ,  $p < 0.05$ ). This decision is because the probability of 0.000 is lower than the 5% (0.05) significance level. Looking at mean values indicated the content of  $PM_{2.5}$  is high in the high-density zone with a mean value of 11.3.7ppm followed by the medium-density residential zone with a mean value of 92.83ppm, while the lowest content was in the low-density residential zone. Also, the result in Table 4 revealed a significant variation in  $PM_{10}$  contents across residential areas in Lagos State ( $F = 10.471$ ,  $p < 0.05$ ). Again, this decision is because the probability value of 0.000 is lower than 5% (0.05) significance level. A look at mean values indicated the content of  $PM_{10}$  is high in the high-density zone followed by the medium-density residential zone and low in was in the low-density residential zone. The high PM contents in the high-density and medium-density areas are expected because these areas have a high human population and concentration of human activities that emit gases favourable to the formation of PM. This is so as a significant portion of PM is generated from the combustion of wood and fossil fuels, agricultural activities, commercial and industrial activities, construction and demolition activities, and the rising of road dust into the air (USAID, 2012; Guerrieri et al., 2016). These anthropogenic activities release a large amount of PM into the atmosphere.

The content of carbon monoxide (CO) did not vary significantly across the residential zones ( $F = 0.700$ ,  $p > 0.05$ ). This decision is because the probability value of 0.503 is greater than 5% (0.05) significance level. The mean values showed that high content of CO was recorded in the high-density residential area (2.72ppm) followed by the medium-density residential zone (1.00ppm). As usual, the low-density residential area had the lowest concentration of CO. The high economic activities and its high traffic congestion are attributed to the high content of CO in the high-density and medium-density residential zones. In a related study, US EPA (2008) stated that CO sources are mobile sources which include both on-road vehicles (e.g., cars, trucks, motorcycles) and non-road vehicles and engines account for the majority of CO emissions. The report also noted that high concentrations of CO normally occur in areas with heavy traffic congestion. These conditions are carried out at unprecedented rates in the high-density and medium-density residential zones which are favourable to CO emissions. Likewise, the content of carbon dioxide ( $CO_2$ ) did not vary significantly across the residential zones ( $F = 0.110$ ,  $p > 0.05$ ). This decision is because the probability of 0.896 is greater than 5% (0.05) significance level. The mean values in Table 4.9 showed that high content of  $CO_2$  is found in the high-density zone followed by the medium-density residential zone. High fossil fuel combustion (electricity, fossil fuel combustion, industrial process, non-road equipment and fire among others) and numerous industrial activities could be responsible for the relatively high contents of  $CO_2$  in the high-density zone compared to the low content in the low-density residential zone. In line with this, Gale, Bradshaw, Chen et al., (2018) stated that emissions of  $CO_2$  arise from a number of sources, mainly fossil fuel combustion in the power generation, industrial, residential and transport sectors.

### **Temporal variation in air pollutants across residential density zones**

The results in Fig: 4 revealed a considerable variation in the concentration of pollutants at different times of the day. In the high-density residential area, the concentration of  $PM_{2.5}$  was comparatively high in the morning. The

high concentration in the morning is expected because it is the period when economic activities are at their peak and this results in the combustion of fuel and an increase in dust content in the atmosphere among others. It is a period in which virtually everybody goes to work, school, hospital market and other reasons for making trips. Traffic congestion is usually a problem at this time of the day due to the increase in vehicular movement and people. A similar pattern was observed for  $PM_{10}$ . An increase in industrial activities around this time may also be responsible for the increased PM content. The result therefore shows that particular matter is found to be comparatively higher in the morning than in the evening.

The results for CO and  $CO_2$  also revealed that high content was observed in the morning. The increase in traffic as a result of high trips and burning of fuel at home is responsible for the increase in CO and  $CO_2$  contents in the morning. Similar environmental conditions occur in the evening, but the traffic situation is somehow reduced when some of the trips are made in the afternoon. In the medium-residential density, the concentration of  $PM_{2.5}$  and  $PM_{10}$  as well as  $CO_2$  was higher in the morning than in the evening. A similar reason for the buildup of  $PM_{2.5}$ ,  $PM_{10}$  and  $CO_2$  in the morning in the high-density area is applicable here. However, higher CO content was recorded in the evening than in the morning. This may be attributed to increased vehicular traffic and industrial activities. In the low-density residential area, the contents of  $PM_{2.5}$  and  $PM_{10}$  as well as  $CO_2$  were higher in the morning than in the evening. An increase in fuel combustion and economic activities among others may be attributed to the increase in the concentration of these pollutants in the morning. A cursory look at the pattern of air pollutants in Fig.4.2 reveals that across the three residential densities, high concentrations of  $PM_{2.5}$  and  $PM_{10}$  and  $CO_2$  occur in the morning. It shows that ambient air quality varies in quantities at different times of the day and this variation is attributed to the nature of activities or economic activities carried out in the area and at that time. In a related study, Makra et al., (2010) stated that in any environment, the daily variations in concentrations of air pollutants are caused by the types of economic activities.

The result obtained in Table 5. therefore, implies that air pollutants tend to be higher in the morning than in the evening. This pattern in the temporal variation in ambient air pollutants or quality is expected due to the increased vehicular movement and traffic buildup, industrial and residential activities, waste incineration and other human activities that favour the emission of these gases into the atmosphere during this time. Traffic congestion is everyday life in the area mostly in the high and medium density residential areas. The increase in traffic in this area according to Njoku, Rumide, Tosin *et al.*, (2016) may be attributed to poor road infrastructure, uncontrolled automobile growth, lack of effective urban mass transit system, and inadequate road networks resulting in the burning of fossil fuel known to be the major contributor to  $CO_2$  emission. A similar trend in the concentration of air pollutants at different times of the day was reported by Magaji and Hassan (2015), Oderinde (2016) and Etim (2016). The study of Oderinde (2016) reported high pollutant levels in the morning.



**Table 5: Mean temporal variation in the content of pollutants in the high-density zone**

<b>Time of the day</b>	<b>PM<sub>2.5</sub> (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>PM<sub>10</sub> (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>CO (ppm)</b>	<b>CO<sub>2</sub> (ppm)</b>
Morning	114.50	154.13	4.25	238.97
Evening	112.81	153.19	1.19	120.08
<b>Medium-density residential are</b>				
	<b>PM<sub>2.5</sub> (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>PM<sub>10</sub> (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>CO (ppm)</b>	<b>CO<sub>2</sub> (ppm)</b>
Morning	96.42	133.00	0.41	189.04
Evening	89.25	118.58	1.00	196.88
<b>Low-density residential area</b>				
	<b>PM<sub>2.5</sub> (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>PM<sub>10</sub> (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>CO (ppm)</b>	<b>CO<sub>2</sub> (ppm)</b>
Morning	73.85	101.15	0.54	212.08
Evening	68.69	93.85	1.00	195.35

## Conclusion

The study has clearly shown that the level of air pollutants tends to decrease from the medium-density residential area to the low-density residential area with increased concentration in the high-density area. Despite the increase in the concentration of pollutants in the high-density residential area, pollutants such as CO and CO<sub>2</sub> do not show clear variation because the residential density areas are contiguous, as such they are influenced by similar environmental conditions. This affirms the first law of Geography by Tobler (1970) which states that everything is related to everything else, but near things are more related than distant things.

The study further shows that high concentrations of CO and NO<sub>2</sub> occur in the dry season with January recorded high contents followed by December, while O<sub>3</sub> and SO<sub>2</sub> are high in the wet season, especially in July and August/September. It further shows that the concentration of pollutants varies in quantities or amount across the residential areas and at different times of the day with high levels found in the morning. The high content in the morning is expected because this period experiences high traffic density and volume as well as experience increased of anthropogenic activities that favour the buildup of pollutants in the atmosphere. Particulate matter and CO are observed to show high concentration in the high and medium-density residential areas because of heavy traffic congestion, and residential and industrial activities prevalent in the area. Across the residential density areas, anthropogenic activities account for the varying levels of ambient air pollutants in the atmosphere. Despite the high contents of pollutants, mostly in high-density areas, the concentrations of pollutants fall within local and international permissible limits such may not pose serious health challenges or problems to people in the area. Based on the research findings, the study suggests that particulate matter is a significant and variant air pollutant across residential areas; as such, government and wealthy private individuals are encouraged to assist in road construction and rehabilitation. As much as possible, unpaved roads should be paved and adequately constructed.

The repairs of roads as well as the completion of abandoned roads will play a significant role in dust generation which reduces the concentration of particulate matter in the atmosphere. and SDG goal 11 can be achieved through the reduction of the adverse effects of [natural disasters](#), the reduction of the [environmental impacts](#) of cities and to provision of access to safe and inclusive green and public spaces.

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### 3. Addressing Inimical Cultural Practices in Nigeria: The case of Female Genital Mutilation a double-dimensional SDG framework

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#### Abstract

Several cultural practices and mores, as well as traditions on the African continent and, particularly, in Nigeria, remain inimical of the United Nation's Sustainable Development Goal (SDG) target 5:3 which focuses on the elimination of all such harmful practices. Female Genital Mutilation (FGM) is a deeply entrenched cultural practice of excision or circumcision. At its extreme is infibulation which is the sewing up of parts of the vagina to preserve virginity. Clitoridectomy, is, ultimately, a form of gender-based violence that has far-reaching, sometimes permanent, and irreversible adverse health and even reproductive consequences for women and girls. FGM violates the human, reproductive and sexual rights of women and girls. Despite this, and contrary to the SDG target 5:3, FGM remains widespread and predominant in several Nigerian cultural spaces. Although its prevalence is varied at the State level, the United Nations Children's Education Funds (UNICEF) report of 2022 indicates that there are 19.9 million survivors of FGM in Nigeria, representing the third highest number of women and girls who have undergone FGM worldwide. In 2015 Nigeria adopted the Violence Against Persons Prohibitions Act (VAPPA) a protocol that prohibits and criminalises FGM. Although Nigeria has subsequently other legal protocols at the State level, it seems there are inconsistencies between the adoption and enforcement of these laws and the continued perpetuation of FGM in Nigeria. This article proffers a two-pronged legal and cultural framework aimed at accelerating the achievement of SDG Target 5 by 2030. We, therefore, recommend among others, the enforcement of relevant laws as well as the deliberate transformation of inimical cultural practices in Nigeria.

**Keywords:** Female Genital Mutilation (FGM), SDG 5:3, Nigeria, Culture, Law

#### Bestriding Culture and Law: An Introductory Overview:

The very concept or notion of Female genital mutilation (FGC/M) remains largely controversial, whipping up sentiments of our colonial past and the racial politics of devaluing African cultural practices. It is interesting to note that Western societies, especially in the Victorian age, practiced various forms of clitoridectomy (cutting off the clitoris). (King, 2018). Today, issues surrounding FGM resonate in several academic spheres including anthropology, sociology, psychology, philosophy, politics, religion, feminism, literature, women's sexuality/rights, human rights, trauma, race, Medicine, law, and several other ancillary disciplines indicating how so deeply entrenched and far-reaching its consequences are in the present. This shows it is indeed a lived experience, a reality in our increasingly globalised world. While FGM is a cultural phenomenon, it may also be seen as a cultural identifier that is widespread and well-known in many societies of the Middle East, North, East and West Africa, particularly in Nigeria and even in other parts of the world such as Europe, North America,

Australia and New Zealand (Cappa *et al.*, 2019) It is almost universal in some countries like Somalia, Djibouti, and Guinea with a prevalence of more than 90% (Obiora *et. al.*, 2020). Aside from Nigeria, other African countries where FGM thrives include Ghana, Mali, Senegal, Sierra Leone, and Ethiopia (United Nations Population Fund (UNFPA), 2024).

Despite being a party to several international human rights instruments that prohibit the violation of girls and women's rights through FGM practice, coupled with the adoption of the Violence Against Persons Prohibitions Act (VAAPA) (2015) and other relevant states laws, UNICEF report indicates that FGM is widespread in Nigeria as there are 19.9 million survivors of FGM in the country representing the third highest number of women and girls who have undergone FGM globally. (UNICEF, 2022) The continued prevalence of FGM is mostly sustained and maintained by cultural taboos and myths even in the 21st century.

According to the United Nations (2018), the global prevalence of FGM has declined nearly one-quarter since 2000 but the rate of progress is insufficient to keep up with population growth, meaning that the number of total cases is expected to continue to increase without further action. In addition, by 2030, one-third of births globally will be in the 30 FGM countries (including Nigeria), a trend that will require accelerated progress to protect women and girls from this practice. The United Nations (2018) therefore, called for accelerating progress on SDG target 5.3, stating that, without immediate action, 'a further 68 million girls could be subjected to this practice by 2030, and sustainable development cannot be achieved without full respect for the human rights of women and girls.'

The practice of FGM is recognized internationally as a violation of the human rights of girls and women, a form of child abuse, breaching the United Nations Convention on the Rights of the Child (CRC), and a severe form of violence against women and girls (World Health Organization, 2023).

The objectives of this paper are to amplify, sustain and continually keep the debates on FGM alive until it is completely eradicated; proffer, simultaneously, legal and cultural resolutions for the acceleration of the eradication of FGM in Nigeria and to unravel some of the cultural myths, taboos and superstitions that surround the perpetuation of FGM.

## **A Brief Review of Relevant Literature**

It is necessary to situate/contextualise the cultural backdrop to FGM. Although it is considered prevalent even in contemporary times, there appears to be a paradoxical silence in the narratives of African and Nigerian writers on this all-important subject matter. This remarkable silence possibly signifies some of the ambivalence, perhaps even a deliberate socio-cultural distancing from the stigmatisation and taboos surrounding the practice of FGM and we shall return to the impact of this later in the paper.

FGM in Literature provides a contemporary framework for the reformation of oppressive/inimical cultural practices through social re-engineering. Particularly in the global south, literature, as a cultural practice, provides the platform for creative innovations. Literature may be deployed to gain socio-cultural traction in the efforts towards eradicating inimical cultural practices. Nevertheless, several literary writers (male and female) from diverse cultural backgrounds, imaginatively, create in their narratives (fiction and nonfiction) critical opportunities/platforms for the interrogation of a wide range of life's issues including those bordering on FGM. We, therefore, turn to literature not only as a cultural artefact which mirrors society but also as a visceral way of

experiencing FGM in our attempt at excavating the cultural mores underlying the practice of FGM.

Many female African writers including Egyptian feminist, writer, and medical practitioner, El Saadawi, (1975) both in her fiction, 'Woman at Point Zero' and in her important memoir: 'The Hidden Face of Eve: Women in the Arab World (1980) call critical attention to the prejudicial oppressiveness of FGM. Similarly, and even more recently, Somalian writer, Ali (2007) in her autobiography, 'Infidel: My Life' captures some of the pain she experiences in the process. Important African American female novelist, essayist and activist, Walker (1992) has also thematised FGM in two important works. The first is a novel-'Possessing the Secret of Joy' and, the other, converted into a film documentary, is: Walker & Pratibha (1994) 'Warrior Marks: Female Genital Mutilation and the Sexual Blinding of Women.' Levin & Assah (Eds) (2009), 'Empathy and Rage: Female Genital Mutilation in African Literature' is a collection of essays by scholars, writers, and activists who simultaneously capture their empathy and anger at FGM. They agreed that the practice should end. Okeke et. al. (2012), explained in their piece that the psychological implications of FGM are accompanied by various degrees of psychological morbidity, including loss of trust, lack of bodily well-being, depression, as well as a sense of betrayal, anger, guilt, and shame.

The scholastic positions in the above review are to the effect that FGM should be eradicated.

### **The Concept and Forms of FGM Performed on Women in Nigeria**

Female genital mutilation (FGM) comprises all procedures that involve partial or total removal of the external female genitalia, or other injury to the female genital organs for non-medical reasons (World Health Organization 2024). FGM practiced in Nigeria is classified into four types as follows (World Health Organization.2024).

Clitoridectomy or Type I (the least severe form of the practice): It involves the removal of the prepuce or the hood of the clitoris and all or part of the clitoris. In Nigeria, this usually involves sexcision of only a part of the clitoris: Type II or 'sunna' is a more severe practice that involves the removal of the clitoris along with partial or total excision of the labia minora. Type I and Type II are more widespread but less harmful compared to Type III which is infibulation. It is the most severe form of FGM. It involves the removal of the clitoris, the labia minora and the adjacent medial part of the labia majora and the stitching of the vaginal orifice, leaving an opening of the size of a pin head to allow for menstrual flow or urine: Type IV or other unclassified types recognized include introcision and gishiri cuts, pricking, piercing, or incision of the clitoris and/or labia, scraping and/or cutting of the vagina (angrya cuts), stretching the clitoris and/or labia, cauterization, the introduction of corrosive substances and herbs in the vagina, and other forms. The procedures are irreversible and they last a lifetime. (World Health Organization 2024).The scope of Sustainable Development Goals (SDGs) on FGM

The SDGs also known as the Global Goals are a set of objectives within a universal agreement to end poverty, protect all that makes the planet habitable, and ensure that all people enjoy peace and prosperity, now and in the future (United Nations Development Programme, 2024). The goals which were formulated following the Rio+20 Summit of the United Nations in Brazil in 2012, built upon the Millennium Development Goals (MDGs) after their expiration in 2015 (Kumi 2019). The SDGs contain 17 SDGs and 169 targets (United Nations) which were adopted by all member states of the United Nations formally in 2015, for the period 2016–30 to address the overwhelming empirical and scientific evidence that the world needs a radically more sustainable approach to



securing a fair, healthy and prosperous future for the present generation, children and grandchildren (Morton *et al.*, 2017). The SDGs came into effect in January 2016, with the sole aim of improving the lives of people and promoting a safe environment. The goals focus on five thematic issues, commonly known as the five Ps which span across the 17 goals. They are people, the planet, prosperity, peace and partnerships. These themes generally address the root causes of poverty and strive to stimulate greater commitment towards improved lives for all generations through interdependent and interconnected mechanisms. This means that efforts at achieving one goal will lead to the attainment of the other goals (Odoom *et al.*, 2024).

The aim of SDG 5 is to 'Achieve gender equality and empower all women and girls.' (United Nations, 2022). FGM is specifically integrated into SDG 5, Target 5.3 which aims to eliminate all harmful practices, such as child, early and forced marriage, and female genital mutilation (United Nations, 2023).

### **The Impact of FGM on SDGs.**

Generally, the practice of FGM is recognized internationally as a violation of the human rights of girls and women (World Health Organization, 2023). Contrary to SDG 5 and Target 3, FGM reflects deep-rooted inequality between the sexes and constitutes an extreme form of discrimination against girls and women. It is nearly always carried out by traditional practitioners on girls and women and is a violation of their rights. The practice also violates a person's right to health, security, and physical integrity; the right to be free from torture and cruel, inhuman or degrading treatment; and the right to life, in instances when the procedure results in death (World Health Organization, 2023). FGM is a form of child abuse, breaching the United Nations Convention on the Rights of the Child, and is a severe form of violence against women and girls, (Royal College of Obstetricians and Gynaecologists, 2015). According to the World Health Organization (2023), the procedure for carrying out FGM involves removing and damaging healthy and normal female genital tissue, and it interferes with the natural functions of girls' and women's bodies. Although all forms of FGM are associated with an increased risk of health complications, the risk is greater with more severe forms of FGM.

The immediate complications of FGM identified by the World Health Organization (2023) include severe pain, excessive bleeding, genital tissue swelling, fever, infections such as tetanus, urinary problems, shock, and death. The long-term complications include painful menstruations, scar tissue, and keloid; pain during intercourse and decreased satisfaction, increased risk of childbirth complications and newborn deaths; need for later surgeries; and psychological problems such as depression, anxiety, post-traumatic stress disorder, low self-esteem (World Health Organization, 2023).

The practice of FGM leading to the foregoing consequences, is always compounded with the risk of causing trauma and leading to problems related to girls' and women's mental health and well-being (World Health Organization, 2024). The consequences above indicate that FGM is a harmful practice and an act of violence affecting only women and girls (United Nation Women, 2022). SDG 5 views sexuality as an equal right that both males and females must benefit from. On the contrary, while males are being circumcised for health and religious reasons, women and girls are cut deliberately to remove their sexual feelings and subjugate them to the dictates of their men counterpart, and it is done without any consent from them (Fafowora & Duma, 2024). The above indicates that FGM is not only a harmful practice and an act of violence affecting only women and girls (United Nation Women, 2022), but nullifies the aim of SDG 5: 3 on gender equality and women empowerment.

## Prevalence of FGM in Nigeria

According to UNICEF (2022), FGM remains widespread in Nigeria. Nigerians are classified as survivors of FGM with their estimate showing that 19.9 million Nigerians have undergone FGM representing the third-highest number of women and girls who have gone through the procedure worldwide also representing about 10% of the global estimate (UNICEF, 2022). Statistics on the prevalence of FGM are compiled regularly through large-scale household surveys in developing countries, predominantly the Demographic and Health Survey (DHS) and the Multiple Indicator Cluster Survey (MICS) (Orchid Project and 28 Too Many, 2023). For Nigeria, the main surveys are the Demographic and Health Survey (2013), the Multiple Indicator Cluster Survey (2016–17), and the Demographic and Health Survey (2018).

The population of Nigeria has almost doubled in the last 20 years, from 127 million in 2002 to 215 million in 2022 (Country Meters, 2022), and out of this, 40.9% of the population is under 15 years of age, which represents 87,838,000 young people (42,943,785 female), (Country Meters, 2022). Between the years 2002 and 2022, the national prevalence of FGM reportedly decreased among women aged 15–49 from 24.8% in 2013 to 19.5% in 2018 (Demographic and Health Survey, 2013:350: Demographic and Health Survey, 2018: 474). However, UNICEF (2022) expressed concern and a 'worrying trend' that based on reports, among girls aged 0–14 years, the prevalence increased from 16.9% in 2013 to 19.2% in 2018 (Demographic and Health Survey, 2013:350: Demographic and Health Survey, 2018: 474).

The prevalence of FGM among girls (19.2% in 2018) means that given the current population, more than 8.2 million girls have been cut (Country Meters, (2022). The Report confirms that in Nigeria at least part of the reported decrease in the prevalence of FGM among women and girls aged 15-49years is due to social desirability bias and community self-surveillance of cutting, because of which women will be more reluctant to report that they have been cut (Orchid Project and 28 Too Many, 2023). Of note is that, among girls whose mothers are uncut, the percentage who have been cut has doubled (Demographic and Health Survey 2013: 353–355: Demographic and Health Survey 2018: 476-478). This is slightly unusual and a matter of concern. Further research by Orchid project and 28 Too Many (2023) into why this is so was indicated in a UNICEF (2013) report that there is a problem of a 'culture of silence' in Nigeria, in which there is a significant gap between people's personal views on FGM and their feelings of social obligation to have girls undergo the cut and a lack of agency in the decision (Orchid Project and 28 Too Many, 2023). This implies that the decrease among women aged 15–49 years of age is not real as many women who have been cut might not confess to having been cut due to the supposed 'culture of silence.'

Across Nigeria, disparities in the practice exist. State prevalence ranges from 62 per cent in Imo to less than 1 per cent in Adamawa and Gombe. The prevalence of FGM is highest in the South East (35 per cent) and South West (30 per cent) and lowest in the North East (6 per cent). UNICEF is initiating a community-led movement to eliminate FGM in five Nigerian states where it is highly prevalent: Ebonyi, Ekiti, Imo, Osun and Oyo. Nearly 3 million girls and women have undergone FGM in these States in the last five years (UNICEF, 2022).

## **Barriers to Eliminating FGM in Nigeria**

The key barrier to eliminating FGM practice can be stated to be the pervasiveness of culture and tradition (28TooMany, 2018a) and religious orientations (Amusan & Asekun Olarinmoye, 2008). Hence, the refusal to abandon the practice because they believed that the practice is beneficial (Odo et al., 2020). The elements are as follows:

### **Sociocultural Factors**

A common reason for the continuous practice of FGM can be traced to the culture and traditions of the people of a particular region. FGM is considered a "social convention which is ensured through a non-written system of rewards and punishments," any attempt to discontinue the practice is met with societal pressure and risk of isolation (Kolawole and Anke, 2010). The culture of FGM is preserved by family and community structures that monitor and enforce the practise. Older women who were cut, such as mothers, grandmothers, and mothers-in-law, play a key role in perpetuating the practice by ensuring that girls within families are cut (Akosile, 2016). As part of the enforcement process, girls are manipulated to accept the value of FGM and their helplessness in the decision-making process. Rewards and sanctions are advanced for conformance and non-conformance respectively (Mberu, 2017).

FGM creates a tribal identity, especially in a multi-tribal country like Nigeria, where different tribes have different reasons and timing for the mutilation. In many tribes that perform FGM around puberty, it is considered a 'rite of passage' symbolizing a transition from asexual childhood to sexual adulthood. An instance is among the Uhrobos and Methu-Yorubas of the Southwestern region of Nigeria, where FGM is performed just before marriage as a 'fertility rite.' They believe the excised part which is eventually sacrificed to the ancestors gives fertility blessings (Kolawole & Anke (2010). In some cultures, in Southwest Nigeria, it is believed that the clitoris poses a health risk for babies and that if the head of a baby comes in contact with the clitoris, the baby will die (Refugee Legal Aid Information, 2018). In other cultures, it is believed that the practice of FGM prevents mother and child from dying during childbirth (Ilesanmi & Ilesanmi, 2018). In some communities, it is considered taboo for an unexcised young girl or woman to be married, and this could lead to her being disowned by her family (Chidera, 2018). FGM is believed to confer inheritance rights on women and girls and is performed as part of the process of social integration (Aliogo, 2024).

### **Religious Beliefs**

The religion of societies also justifies the practice of FGM as promoting the cleanliness of women. There are no clear recommendations from the Bible or Koran about the cutting of women (Mberu, 2017). While some religious leaders promote it, others consider it irrelevant to religion and support its elimination (Ilesanmi & Ilesanmi, 2018). However, FGM is practiced both in Christian-dominated parts of Nigeria (Southern zone) and in Muslim communities (Northern zone). FGM is also linked to the religious obligation to preserve a girl's virginity before marriage (Refugee Legal Aid Information, 2018).

Other reasons are personal beliefs by persons that FGM improves the hygiene and cleanliness of women. The external female genitalia are considered dirty and unsightly and should be removed to promote hygiene, prevent illness and provide aesthetic appeal. In Nigeria, more Christians have undergone FGM and are more likely to

circumcise their daughters unlike their Muslim counterparts (Gbadebo et. al., 2021).

### **Medicalization of FGM**

Although FGM is mainly performed by traditional birth attendants and cutters in Nigeria, there are indications of a transition to the medicalisation of the practice (NPC and ICF., 2014). FGM medicalisation refers to 'situations in which FGM is practiced by any category of health-care provider, whether in a public or a private clinic, at home or elsewhere, including the procedure of reinfibulation at any point in time in a woman's life. (Umar & Oche, 2014). Some health workers also encourage FGM practice due to their personal beliefs and in some cases for economic gains. Parents are inclined to patronise these health workers trusting their ability to perform the procedure on their female children without complications. Unfortunately, despite the assumptions about medicalisation being safer with minimal complications, it does not legitimise FGM and does not address the issues of the violation of human rights (Obianwu *et al.*, 2018).

### **Gender Issues/Inequalities**

FGM is an extreme form of discrimination against women and girls (Azuonwu & Ezekiel, 2020). FGM is a gendered harmful practice that reflects the imbalance of power between men and women and perpetuates inequalities and control over women and girls. Achieving gender equality is at the core of the 2015 Sustainable Development Goals (SDGs) Goal 5 and the elimination of FGM is critical to this goal. (Makinde et al., 2017). The imbalance in gender roles which limits women and girls, leading to a “male-centric society” has led to the denial of women's rights as reflected in the practice of FGM (Olanrewaju, 2020). More men than women supported the perpetuation of FGM reflecting the patriarchal nature and the limited agency women have in taking a stand against it (Adeyinka et al., 2009). The strong gendered dimension of FGM is also perpetuated by the fact that women are unable to speak out and openly communicate their views. Such discussions are considered taboos; women and girls are bound by the culture of silence.

### **Socio-Economic Factors**

Socio-economic factors such as income, education, employment, and social support play a significant role in the perpetration of FGM. Cultural and ethnic practices that are potentially harmful to health are usually more common among communities with lower socioeconomic status where people are least likely to be empowered (Ojua et. al., 2013). In some communities, the practice of FGM was perceived to have some form of economic advantage. In some cultures, girls who went through this ritual were showered with gifts from community members and this motivates girls from poor families to subject themselves to the procedure (Olajumoke Ereola et al., 2020). Some health workers clandestinely performed FGM for economic gains and to protect the rights of people in their environment (Doucet et al., 2017). Eliminating the practice invariably would mean stopping the means of livelihood for the circumcisers.

### **Efforts at Eliminating FGM**

In Nigeria, a multi-disciplinary approach has been used to ban the practice of FGM: through the formation of legislative and policy frameworks, research, medical intervention (treatment of complications) for cut girls and

women, sensitization, mass mobilization, and community action. (United Nations Population Fund 2021). A series of human rights instruments dating from 1948, which are legally binding on States' Parties to the UN, provide for the health rights, non-discrimination based on sex or gender, and physical and mental integrity protecting for everyone including women and girls. Being a discriminatory practice, FGM violates each of these rights.

Being a State Party to the United Nations (UN), Nigeria has obligations to protect and promote the rights of women and girls (Federal Ministry of Health, 2021) as provided by the international human rights laws. Consequently, some of the provisions of these human rights instruments were incorporated into the Nigerian laws. The major global international instruments relevant to Nigeria include the Universal Declaration of Human Rights (UDHR) (1948), the International Covenant on Civil and Political Rights, (ICCPR), (1966), the International Convention on Economic, Social and Cultural Rights (ICESCR), (1966), the Convention on the Elimination of Discrimination Against Women (CEDAW, Convention on the Rights of the Child (CRC) and Beijing Declaration of 1995.

Although most of these instruments do not specifically prohibit FGM, they variously set out the rights of citizens that are capable of being violated by FGM, and impose obligations on States' Parties to respect, implement, and enforce the provisions of those international instruments. For example, individual rights guaranteed under the UDHR, ICESCR, ICCPR, and CEDAW include the inherent freedom and equality of everyone, the right to life, liberty, and security of persons, prohibition of torture and cruel, inhuman or degrading treatment or punishment, equal protection and equality of all before the law, freedom from discrimination based on sex, and right to the enjoyment of the highest attainable standard of physical and mental health.

Convention on Elimination of Discrimination Against Women (CEDAW) in Article 2 (f) further obligates States Parties to modify the social and cultural patterns of conduct of men and women towards the elimination of prejudices and other practices that are based on the inferiority or superiority of either of the sexes. The Convention on the Right of the Child (CRC) in Article 24(3) calls on States' Parties to protect children against discrimination or punishment and abolish traditional practices prejudicial to the health of children. According to Article 20 of CEDAW General Comment 19 (1992). FGM is one such practice.

The Beijing Declaration and Platform of Action (1995) calls on states to urgently eliminate violence against women and prohibit FGM. This is reiterated by the African Charter on Human and Peoples' Rights, and the Protocol on the Rights of Women in Africa, (2006) (the Maputo Protocol) which prohibits violence against women and all forms of FGM in its Article 5 (b). The African Charter on Human and People's Rights (the Banjul Charter) (1981) in Articles 4 and 5 recognize the respect for life, dignity and integrity of persons while Article 16 ensures the right of every individual to the best attainable state of physical and mental health. Article 18(3) requires the government to ensure the elimination of every discrimination against women and protect the rights of the woman and the child.' Article 21 (1) of the African Charter on the Rights and Welfare of the Child (ACRWC) (1990) calls on States '...to eliminate harmful social and cultural practices affecting the welfare, dignity, normal growth and development of the child' (1990).

The Sustainable Development Goals (SDGs) (United Nations 2023) also provide a framework for respecting the rights of women and girls. The goal specified as SDG 5 stipulates that countries should aim to achieve gender equality and empower all women and girls. The targets of this goal include to:

*end all forms of discrimination against all women and girls everywhere, eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking, sexual and other types of exploitation, eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation. (United Nations Women, 2023).*

The Constitution (1999) is the foremost law that provides for the protection of fundamental rights of all Nigerian citizens, including women and girls. Like in the provisions of other international instruments such as the Universal Declaration of Human Right (UDHR), (1948) International Covenant on Civil and Political Right (ICCPR) (1966), and International Covenant on Economic, Social and Cultural Right (ICESCR) (1966) which it enshrines, it does not specifically refer to gender-based violence, harmful traditional practices or FGM. It, however, provides for the right to life in section 33 of the Constitution of the Federal Republic of Nigeria, 1999 (as amended), the right to freedom from discrimination based on sex in section 42 (Constitution of Nigeria, 1999), and the right of every individual to respect for the dignity of their person and to freedom from torture and inhuman or degrading treatment in section 34 (Constitution of Nigeria, 1999). All these rights of women and girls are being adversely affected by FGM.

The Child Rights Act (CRA) (2003) is a reflection of the CRC and the African Charter on the Rights and Welfare of the Child (ACRWC) (1991) previously ratified in Nigeria. Although the CRA does not specifically mention FGM, section 1 of the Act provides that the best interest of a child would be the paramount consideration in all actions. Under section 24 no person shall tattoo or make a skin mark or cause any tattoo or skin mark to be made on a child. Skin mark in section 277 refers to 'any ethnic or ritual cuts on the skin which leaves permanent marks.' Knowing the process involved in carrying out FGM, it can be said that this provision falls within the area of FGM thus prohibiting its practice. The Act also provides in section 4 for a child's right to survival and development freedom from discrimination in section 10, the right to dignity in section 11 and to enjoy the best attainable state of physical and mental health in section 13.

The major challenge of the CRA is the lack of adequate implementation as all the states of Nigeria have not adopted the Act while many that have adopted it are not enforcing it. The United Nations International Children's Education Fund (2022) has revealed that 31 states of Nigeria have so far enacted the equivalents of the Child Rights Act while five states are yet to domesticate the law (United Nations Children Fund (2022)). One major reason attributed to this is the lack of political will to promote and protect the best interest and welfare of the already vulnerable, marginalised, disadvantaged, and discriminated child (Ladan 2021). Thus, FGM and other abuses against children go on unabated.

The Violence Against Persons (Prohibition) Act, (VAPP) (2015) is the first federal law attempting to prohibit FGM across the whole country. The objective of the VAPP Act is to eliminate all forms of violence in private and public life and provide protection and effective remedies for victims and punishment of offenders. Section 6 (1) of the Act specifically prohibits the 'circumcision or genital mutilation' of the girl child or woman. Under section 6 (2) any person who performs FGM or engages another person to do so is guilty of an offense punishable on conviction to imprisonment for a term of 4 years or a fine of #200,000.00 or both while section 6 (3) criminalises

an attempt to commit FGM which is punishable by 2 years imprisonment or #100,000.00 fine or both. Under section 6 (4), any person who incites, aids, abets or counsels another to carry out FGM is punishable on conviction to a term of imprisonment not exceeding 2 years or to a fine not exceeding N100,000.00 or both.

Although the VAAP Act was described as an epochal event, marking a national commitment to eradicating FGM through legislation (Nigeria Federal Ministry of Health 2021), the Act is not without its shortcomings. The VAAP Act only applies in the Federal Capital Territory (FCT) of Abuja implying that other states that do not wish to adopt the Act cannot be compelled to do so, thereby contributing to lack of effective implementation. However, it has been adopted thus far in 32 States (VAAP Tracker) plus the FCT. These states have enacted the Act into their state laws to deal with child abuse, prohibition, and criminalization of the practice of FGM and such offenses. The states' laws include the Ebonyi State Violence Against Persons (Prohibition) Law, (2018), Kaduna State Violence Against Persons (Prohibition) Law, (2018), Imo State Female Genital Mutilation (Prohibition) Law (2017), Violence Against Persons (Prohibition) Law of Ogun State (2017), Oyo State Violence Against Women (VAW) Prohibition Law (2016). Other states with laws prohibiting FGM before the enactment of the VAAP Act include Edo State, Enugu State, Cross-Rivers State, and Rivers State.

The VAPP Act has been variously criticized for not addressing FGM carried out by health professionals or in a medical setting; the broad nature of the law, however, would suggest that any member of the medical profession who performs or assists in FGM would also be guilty of a criminal offence and punished accordingly (28Toomany 2018).

Apart from legislative intervention towards eliminating FGM, other efforts of the Nigerian government include the adoption of policies (United Nations Food and Population 2021). For example, the National Health Policy was adopted in 2016 (Nigeria Federal Ministry of Health 2021). It provides the general strategic direction of the country concerning health and promotes universal access to comprehensive sexual and reproductive health services for adolescents and adults throughout their life cycle, it addresses FGM elimination. A key policy orientation/initiative in the Policy is to promote the enactment and implementation of legislation for mitigation of harmful cultural practices including FGM (United Nations Food and Population 2021).

Before the National Health Policy (2016), there have been several efforts over the years to reduce and eliminate FGM through: the endorsement of the 47th World Health Assembly Resolution to eliminate FGM, the National Baseline Survey on Beneficial and Harmful Traditional Practices (1998): National Policy and Plan of Action on Elimination of Female Genital Mutilation in Nigeria (2002): Best Practices on the Elimination of Female Genital Mutilation (FGM)-The Nigerian Experience (2004), National Gender Policy, 2006 (Nigeria Federal Ministry of Health 2021).

A major policy is the National Policy and Plan of Action for the Elimination of Female Genital Mutilation in Nigeria 2013-2017 (2013). It was developed in 2013 and valid until 2017 with an extension to 2018 (United Nations Food and Population 2021). Others are the UNFPA-UNICEF Joint Programme on Elimination of FGM: Accelerating Change, aligns with the 2013 National FGM Policy which also sets out an institutional framework for addressing the elimination of FGM in the country. 'Accelerating Change' has a global target and contributes to the attainment of Sustainable Development Goal 5.3, which seeks to eliminate all harmful practices, such as FGM. The Joint Programme supports various aspects of work to eliminate FGM in the five states with the highest FGM prevalence in the NDHS 2013, namely: Ebonyi, Ekiti, Imo, Osun and Oyo State (United Nations Food and

Population 2021). Furthermore, various interventions and strategies are being implemented through community awareness programmes, capacity building, community and interpersonal engagements, media (Mass and Social), campaigns and provision of FGM-related health, social and legal services to survivors of FGM, and girls and women at risk of FGM. Other interventions are advocacy for the implementation of the VAPP Act, 2015 and the CRA 2003; as well as other state-level Child Rights Laws (CRL) and state-level legislations against FGM (Nigeria Federal Ministry of Health 2021). On 28 April 2022, the Nigerian Government and UNICEF launched a campaign to end FGM titled 'A Movement for Good to End FGM in Nigeria.' This is in response to a worrying trend of increasing cases among Nigerian girls aged 0–14 years in five Nigerian states where the practice is highly prevalent: Ebonyi, Ekiti, Imo, Osun, and Oyo. The campaign follows successful high-level commitments to end FGM in countries such as Burkina Faso, Egypt, and Kenya (United Nations Food and Population 2021).

Despite the efforts analysed above, coupled with the progress made so far, while noting also that FGM is currently a criminal offense prohibited by law in several states of Nigeria and the FCT, FGM remains a widespread, accepted, and ongoing practice in several states and communities and millions of girls remain at potential risk of being harmed (United Nations Food and Population 2021). This calls into question the level of implementation of the laws and the root drivers of FGM, the underlying social norms entrenched in communities and the potentially effective approaches to address and transform the social norms.

Implementation and enforcement of laws and policies are generally weak across Nigeria. As posited by UNFPA-UNICEF (2017) it has not been possible to identify any prosecutions brought under the VAPP Act in Nigeria since its introduction in 2015. A national legal framework that affirms that FGM is a human rights violation plays an essential role. Nearly all 29 African countries where FGM is most prevalent (Nigeria inclusive) have legislation against it, yet enforcement remains a significant challenge (UNFPA-UNICEF 2017).

### **Towards Achieving SDG Goal 5:3**

The paper recommends among others, the enforcement of relevant laws as well as the deliberate transformation of inimical cultural practices in Nigeria. Steps to achieving SDG 5: 3 can be broadly categorised into two namely: Improving the Legal Framework and abolishing the inimical traditional practices.

#### **1. Improving the Legal Framework**

Following from findings on the analysis of the legal framework above, it is imperative for efforts to be geared towards improving, implementing, and enforcing the extant national legal framework. The VAAP Act, 2015, being the only national law that specifically prohibits FGM should be improved. A clear definition of FGM in the law is needed, which should include all types of FGM, including those specifically practiced in Nigeria. The law needs to prohibit, criminalise and penalise the practice of medicalised FGM. The law needs to be adopted and domesticated across all states of Nigeria and made accessible to all members of society. It should be easy to understand in all local languages. This includes raising awareness about the legislation at the national and community levels; building the capacity of members of the justice sector such as police, prosecutors, and judges; providing free legal services for girls and women at risk of and affected by FGM; and creating synergies with other sectors, including health, education and social welfare, support access to justice for girls and women who have experienced or are at risk of FGM and strengthening girl- and women-friendly legal services, including



capacity building for social workers, protection officers, prosecutors, judges and lawyers (UNFPA-UNICEF 2022). Women and girls need to be educated on their rights and community efforts towards changing cultural and social norms (28TooMany 2018). The law should be used as a deterrent, to protect women and girls at risk and to prevent all forms of FGM from taking place (28TooMany 2018).

## **2. Abolishing the inimical traditional practices.**

These are culture-based negative practices seen as norms because they have been propagated from generation to generation and they are targeted against women, children, and the girl child. It is a form of violence against women, children, and the girl child. FGM is a good example (Udomoh 2017). Since culture is dynamic and not static, practices that are harmful to health and well-being (like FGM) should be abolished (Udomoh 2017).

At the root of the practice of FGM is a combination of structures and institutions that perpetuate gender inequality, and social norms that sustain the practice (Coll et. al., 2022). Focusing on shifts in social norms related to FGM, while overlooking structures and institutions that perpetuate gender inequality, may limit efforts to eliminate the practice. These are systemic barriers, such as poverty, lack of services and infrastructure, and shocks and crises, which are all critical factors that contribute to gender inequality and must be addressed (Harper et. al. 2020). Strategies to improve girls' and women's empowerment by increased education levels, access to child protection and health care services, and policies and legislation that protect girls' and women's rights combined with shifts in the wider norms that support FGM may be important for achieving significant reductions in the practice (Coll et. al., 2022). For this reason, transformative changes including social, political, and economic inclusion are critical for any shift in norms, while norms change, in turn, enhance progress in the other areas (Harper et. al., 2020).

The 19.9 million girls and women FGM survivors in Nigeria can be used as effective agents to implement appropriate interventions within their communities (United Nations (2024).

The Federal and State Governments should ensure that adequate funding is available for anti-FGM programmes to disseminate clear and accurate information about the law. Local police and the judiciary need adequate support and should be encouraged to apply sentences provided for by the legislation (28TooMany 2018). Civil society groups, the media, and the public should continue to campaign vigorously against FGM toward its eradication.

## **Conclusion**

The analysis in this article shows that culture and tradition perpetuate the practice of FGM in Nigeria while the major law, the VAPP Act lacks adequate enforcement. Apart from the shortcomings of the Act, sociocultural practices that are rooted in culture and traditional values may be resistant to policy/legal instruments (Sanni & Bishwajit, 2018). While a more comprehensive legal framework for addressing FGM is an important step in the right direction, understanding and addressing the social norms that perpetuate the practice is critical to fostering lasting behaviour modification that is needed to sustain change (UNICEF, 2016b). Applying the recommendations above will in no small way contribute to the eradication efforts of FGM in Nigeria crucial to meeting the global commitment to end FGM by 2030 as required by SDG 5:3.

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#### 4. Effective Implementation of Sustainable Development Goals in Nigeria: A Gender Inclusion Perspective

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##### Abstract

*Throughout the history of human civilization, women have faced discrimination, which has reduced them to occupying lesser positions and participating in limited roles, as compared to men. Thus, women have played nonexistent or at best minimal roles in developmental efforts in a largely patriarchal world. Over the years, proponents and advocates in development have proposed the inclusion of gender relations as it concerns the experiences and contributions of men and women. This is based on the resolve that gender inclusion was necessary for the attainment of sustainable development. The objective of the study is to examine Nigeria's chances of attaining the Sustainable Development Goals (SDGs), within the purview of gender inclusiveness. It explores the level of inclusion of women concerning Nigeria's journey towards the attainment of sustainable development. The study is expository in nature as it analyzes the secondary data obtained from the SDG5 – Gender Equality Performance Indicator from 2018 to 2022, for Nigeria. The results showed a steady decline in gender parameters such as women's participation in parliament, employment and education. Therefore, the study suggested ways of improving gender inclusion practices through mental restructuring, gender policy articulation and execution, recognition of women's productivity, enforcing women's rights of enjoyment and so on.*

**Keywords:** Gender, Gender inclusion, Gender equality, Development, Sustainable Development.

##### Introduction

The year 1911 marshalled an epoch-making event for gender inclusion with the establishment of International Women's Day (Blessing and Fred, 2022). This ushered in the consciousness of the nations in recognizing the role of gender in development. The global movement in ensuring and enacting country-by-country gender policies that promote equality, and equity was mainstreamed as an important aspect in the advancement of civilization (Archibong, Bassey and Nwagbara, 2018).

111 years later giant strides and advances have been made in the global promotion of gender equality. These advances are reflected in greater access to education for the girl child, a higher percentage of women in senior leadership positions, and more equality in civil and political rights for the female gender (Ejumudo, 2013). While the gains of gender equality are high for most developed countries (MDCs), they are low in less developed countries (LDCs).

Nigeria, being, a strongly patriarchal society, has seen the gender gap continually widen. Discrimination, exclusion and inequality are continually meted out to the female gender in education, employment, corporate and political positions. Nigerian women occupy a paltry 6.7 per cent of political positions as against the global

average of 22.5 per cent (Ugwuanyi and Formella, 2022). This is despite the global drive towards promoting gender equality and inclusiveness. This creates a situation whereby the less patriarchal societies are synonymous with development while the highly patriarchal ones are synonymous with underdevelopment (Fallon, and Viterna. 2015, Mikkola and Miles, 2007).

Eight years into the implementation of the Sustainable Development Goals (SDGs), Nigeria has continued to score below average on SDGs ranking generally and SDG 5 particularly, which is Gender Equality. With seven years to go before the deadline for the attainment of the SDGs, Nigeria faces the unfortunate eventuality of failing to meet the global goals of sustainable development, especially as the tasks remain enormous and insurmountable. This portends an unfavourable forecast of Nigeria's likelihood of ever attaining sustainable development. In this regard, the objective of the study is to examine Nigeria's chances of attaining the target for Agenda 2030, within the prism and purview of gender inclusiveness.

## CONCEPTUAL CLARIFICATION

### Gender

Gender refers to the “roles, behaviour, activities and attributes that a given society at a given time considers appropriate for different groups of people (men and women)” (ILO, 2019). In this study, gender refers to the behaviour, roles and actions expected of a person by society because of being male or female. Thus, gender is a sociocultural construct which is determined by society based on the sex or biological makeup of an individual.

Traditional gender roles are often ascribed to men and women in specific spheres, with men expected to be providers and women expected to be homemakers. However, these roles are changing, and many individuals are challenging and redefining traditional gender norms. Understanding gender as a social construct is crucial for promoting equality and addressing gender-based discrimination.

### Gender equality

This refers to “Equal conditions, treatment and opportunities for women and men, girls and boys in realizing their full potential, human rights and dignity, and for contributing to (and benefitting from) economic, social, cultural and political development” (UNICEF, 2017). Gender equality involves equal access to opportunities, resources, and services for all individuals, regardless of their gender. It is considered a fundamental human right and is deemed necessary for the creation of a fair and egalitarian society.

The clamour for gender equality arose from the fact that women and girls have continued to face discrimination, violence, and marginalization in many areas of life. This creates a situation of gender inequality whereby an individual is unfairly discriminated against and met with unfair practices due to their gender. Eradicating gender inequality requires actively challenging and changing harmful gender yardsticks, promoting inclusiveness, and supporting policies and practices that empower women and girls.

### Gender inclusion

This refers to the “initiatives, activities or programmes that are open to both men and women but are designed to overcome any barriers to the full participation that one of the two sexes may experience” (International Finance Corporation, 2020). This study recognizes gender inclusion as involving the creation of spaces where individuals

of all genders feel valued, respected, and supported. Gender-inclusive spaces sue for tolerance, empathy and a sense of belonging, and address the unique experiences and challenges faced by individuals who fall into various gender types.

### **Development**

This is a “multi-dimensional investment in human capital, physical infrastructure, institutions, and environment” (Eneji *et al.*, 2016). This study conceives of development as the process of growth, progress, and advancement in various aspects of life, including economic, sociopolitical, cultural, technological and environmental areas. Development is a multifaceted and dynamic process that enables a person, community, and society to improve their current state. This usually comes through the acquisition of new skills, knowledge, and technologies that result in increased productivity, innovation, and competitiveness.

### **Sustainable Development**

Brundtland in 1987 defined sustainable development as development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (Bellu, 2011). Sustainable development is a holistic approach that balances economic growth, social inclusion, and environmental protection to ensure a thriving planet for future generations. It recognizes the interconnectedness of human well-being, economic prosperity, and environmental health, and seeks to reconcile the needs of the present with the needs of the future. Sustainable development requires a fundamental shift in how we think and act. It demands that we move beyond short-term thinking and prioritize long-term benefits, adopt circular economic practices, and embrace renewable energy sources. It also requires that we recognize the intrinsic value of nature and the rights of future generations to inherit a healthy planet.

### **Sustainable Development Goals (SDGs)**

This was a global call to action for people, planet and prosperity, aiming to enhance economic, social and environmental dimensions of social development through the implementation of 17 sustainable goals (Ogisi and Begho, 2021). SDGs will be explained further in subsequent subheadings.

## **GENDER ISSUES IN DEVELOPMENT**

Throughout history and human civilization, women have faced discrimination, which has reduced them to occupying lesser positions and participating in limited roles, as compared to men. This is because the primordial societies were male-dominant, which prohibited or limited women from being involved in activities that were exclusive to men. As a result, men were involved in outer social and economic activities while women were confined to domestic and household affairs, (Perigo and Mangila, 2020).

Thus, the observable gender biases which existed on the global front saw the lives of women and girls fixated at the family level (Mikkola and Miles, 2007). The norms and rules which were established and dictated by society at large stereotyped women as incapable of women of holding certain jobs or leadership roles as those demanded traits which were assertive and tough. Rather, women were deemed as possessing those nurturing and homemaking characteristics that confined them within the customary territory of childcare and home

management. Essentially, women were confined within the household space, while men were handed eminent roles and participation fields that saw them making impacts in governance, politics, public affairs, the economy and the overall development of society (Perigo and Mangila, 2020).

Women have played non-existent or at best minimal roles in developmental efforts in patriarchal settings. Flood, (2004) noted that women's development sectors are often weak, marginalized, underfunded, and have little impact on mainstream developmental policies, programs and processes. It was not until years after the Second World War that the relevance of gender in development was not recognized. More specifically, the period of 1975 to 1995 saw radical changes in development as an exercise that involved equity in gender involvement (Pati, 2022).

Perigo and Mangila, (2020) observed that an American sociologist named Lester Ward was instrumental in challenging the way knowledge, customs, practices and perceptions that people had about gender. Aside from establishing a new model for assessing gender relations, he partook in women's liberating activities that enhanced the political and social standing of women in the United States. Thus, organizations, both local and international, were urged and demanded to work in communities and address development and empowerment without taking into cognizance the issue of gender. Over the years, proponents and advocates in development have proposed the inclusion of gender relations as it concerns the experiences of men and women. The importance of gender relations in development, as espoused by Abebe (2015), was necessary for the following reasons.

1. It recognizes, diagnoses, and remedies gender-based discrimination which leads to development programs that are inclusive.
2. It facilitates development that has positive, far-reaching socio-economic and cultural impact through active participation of women and men in information aggregation and analysis based on gender.
3. It enhances the opportunities for successful implementation of development planning and interventions by considering division of labour and access to, control of resources on a gender viewpoint as it involves and affects men and women.
4. It allows for a more efficient use of resources in development by considering social, technical and economic considerations that involve gender groups and individuals.
5. It pushes the drive for global gender parity to become a central feature in the development process which could result in alleviating world poverty, removing particularly gender inequalities will give the world a better opportunity to attain sustainable development.
6. It enables activists, practitioners and policymakers in development to understand gender relations and how they are shaped by power dynamics to determine the behavior and actions of men and women in development interventions.
7. It proffers understanding to the social construct of gender which defines the interactions that occur between men and women in development in terms of power relations, decision-making, control of resources and income in households.
8. It allows for the ranking of development initiatives based on the considered needs of men and women, as well as other socially disadvantaged and marginalized groups so that they could be targeted for development opportunities.

9. It facilitates social and institutional change which could result in sustainable development with justice and progress.
10. It leads to policy linkages which address, integrate and prioritize balanced gender inclusion into policy formulation of development initiatives and interventions.

With the recognition of the imperatives of gender consideration in development, global gender movements were initiated to improve gender relations on a global scale. By the 1970s, some key concepts emerged in pursuing the issue of gender inclusion in development namely: Women in Development (WID), Women and Development (WAD), Gender in Development (GID) and more recently, Gender and Development (GAD) (Pati, 2022). The movements of WID and WAD gained global acceptance as a means of enhancing gender involvement in development. These concepts in gender development focused on women as the missing link in the quagmire that human development had found itself in recent centuries (Aguinaga, Lang, Mokrani, and Santillana, 2013).

Consequently, the main strategy in addressing the exclusion of women from the development process was to focus on women empowerment programmes and projects. The GID and GAD frameworks focus on the relations between women and men and present the unequal relations of power that prevent equitable development, and women's full participation as the problem (Aguinaga, Lang, Mokrani, and Santillana, 2013). The goal of the GID/GAD framework is equitable and sustainable development, with women and men playing active roles as decision-makers (Pati, 2022).

There were initiatives which were proposed and adopted as global policies for addressing gender issues in development. One of which was quotas and proportional representation. These are generally seen as laws that allocate quotas to women in a view to ensuring the promotion of gender balance in society. Quotas are considered as a legitimate means of securing this end (Leach, Mehta and Prabhakaran, 2016).

In many countries, the societal exclusion of women in various strategic strata of life has alluded to a myriad of reasons ranging from financial, cultural, and traditional to political (Pati, 2022). Owing to this fact and the reasons that have made it so implies that quotas should not be seen as discrimination towards men. Instead, it is perceived as a positive form of discrimination which has become adopted into the laws and constitution of the land for most countries of the world.

## **GENDER ISSUES AND PROBLEMS IN NIGERIA**

In patriarchal societies like Nigeria, it is a known fact that the female gender has always been exposed to variable forms of discrimination that they are females. This is because, aside from not having in place specific laws or policies to promote gender inclusion, the Nigerian climate is not gender friendly. This is due to a myriad of determinants which as explained below (Makama, 2013).

1. **Ideological Factor:** Ideologically, the Nigerian society is patriarchal. As a patriarchal system of male domination, Nigeria shapes women's relationships in all spheres. It transforms males and females into men and women and constructs the hierarchy of gender relations, giving rise to male privileges, where men have more access to societal resources and positions than women (Makama (2013). The gender role ideology is used as an ideological tool by patriarchy to place women within the private arena of the home as mothers and wives and men in the public sphere.
2. **Political Factors:** The nature of politics is an important factor in the inclusion or exclusion of women in

politics (Ugwuanyi and Formella, 2022). Male domination of politics, political parties and the culture of formal political structures is another factor that hinders women's political participation. Often male-dominated political parties have a male perspective on issues of national importance that disillusion women as their perspective is often ignored and not reflected in the politics of their parties (Ugwuanyi and Formella, 2022). Also, women are usually not elected to the position of power within party structures because of gender biases of male leadership.

3. **Socio-Cultural Factors:** The Nigerian traditional social structures have been significantly characterized by peculiar cultural practices that are potentially disadvantageous to women's emancipation, such as early/forced marriage, wife-inheritance and widowhood practices (Akanle, 2011). The gender status quo is maintained through low resource allocation to women's human development by the state, society and the family (Ejumudo, 2013). This is reflected in the social indicators which reflect varying degrees of gender disparities in education, health, employment, ownership of productive resources and politics in all countries (Ejumudo, 2013).
4. **Economic Factors:** The economic sector of Nigerian society is one area where discrimination against women has been richly pronounced (Ejumudo, 2013). The role of women in employment and economic activities is often underestimated because most women work in the informal sectors, usually with low productivity and incomes, poor working conditions, with little or no social protection (Kemi and Jenyo, 2016). The denial of women's inheritance and land rights has made their economic participation considerably constrained and by implication, their educational aspirations (Makam, 2013).
5. **Bio-socio Factors:** The socialization process of the girl child in Nigeria, as observed by (Kangiwa, 2015), places much emphasis on the biological makeup of the female gender. And this has been evoked as a factor hindering women's empowerment and political participation. Their roles as mothers and wives have also been culturally influenced and predetermined just because they are females. The expectation thus is for them to be gentle, provide care for their husbands and children (Kangiwa, 2015).

### **PROMOTING GENDER EQUALITY IN NIGERIA: THE NATIONAL GENDER POLICY**

The Gender-Responsive Policymaking Handbook (2020) defines gender policy or gender-responsive policy as an inclusive policy that considers the needs and interests of both women and men as well as the specific needs of subcategories within the main framework of gender.

Kura and Yero, (2013) argued that the existence of a National Gender Policy was a necessity “due to the permissive nature of gender discrimination worldwide”. Thus, a policy of such nature was crucial to promote gender equality, especially as closing the gender gap was a causative factor to ensuring development.

To road to the establishment of a national gender policy in Nigeria dates to the pre-independence era of the country's history. Shortly after the Second World War, the UN, in 1948, drafted a declaration of a charter on human rights which contained the phrase, “All human beings are equal” as it pledged equal opportunity for men and women (Leach, Mehta and Prabhakaran, 2016). Decades after, the 1995 Beijing declaration demanded 30 per cent of women's representation in government (Abolade, 2021). Prompted by these epoch-making events, the Federal Republic of Nigeria ensured that the constitution enshrines the concept of equality of rights of citizens of

the country. Hence, it was enshrined in the law of the land that women were required to possess the same rights as men to participate in governance and public life (Raheem and Garba, 2017).

However, in practice, this is not the case, as Nigeria, being a male-dominated society tends to relegate the female gender to the background. Statutory laws in Nigeria do not give recognition to women as equal to men. Be that as it may, there have been policies put forward by successive governments to enhance gender inclusiveness in Nigeria such as:

- Better life for rural women (1987)
- Family Support Programme (1994)
- Family Economic Advancement Programme (FEAP) (1996) (Ejumudo, 2013)

At the return to democracy, Nigeria established the Ministry of Women Affairs and Poverty Alleviation in 1999 followed by the passage of the law on National Policy on Women in the following year of 2000 (Akanle, 2011). The need for the policy was “to fulfil the yearnings as well as (promote) the efforts of federal, state and local governments, non-governmental organizations, international development partners, the private sector, concerned corporate bodies and individuals to integrate women fully into national development, to remove those gender inequalities that have evolved through structures and processes created by patriarchy, colonialism and capitalism” (Akanle, 2011).

Moreover, (Akanle, 2011) noted that the inadequacy of the National Policy on Women to address the gender gap issue in Nigeria led to the proposition and adoption of a national gender policy in 2006. The National Gender Policy principally focuses on the following basic principles which aim at promoting gender equity in Nigeria. It includes:

- Identification of gender mainstreaming as a development approach and tool for achieving social transformation, agenda for economic reform, value reorientation and evidence-based planning,
- A realization that results and efficient focused policy implementation required from all stakeholders, a cooperative and comprehensive interaction,
- Recognition of gender issues is central to and critical to the achievement of National Development Goals and objectives and a requirement for all policies to be reviewed to reflect gender implications and strategies as contained in the gender policy and implementation modalities specified in the National Gender Strategic Framework and,
- Promotion and protection of human rights, social justice and equity (National Gender Policy, 2006).

To achieve the objectives of the National Gender Policy, the following strategies were employed by the government:

- Partnership, policy and programme reforms through mainstreaming of gender concerns at all levels.
- Agenda of economic restructuring reforms for enhanced productivity and sustainable development, which addresses the needs of women children, and other vulnerable groups.
- To enhance required technical expertise and positive gender culture, the policy advocated for the provision of capacity building and gender education and,
- Legislative reform to guarantee gender justice and respect for human rights (National Gender Policy, 2006)

The main goal of this National Gender Policy was therefore to establish a clear vision and framework to guide the

process of developing laws, policies, procedures and practices that will ensure equal rights and opportunities for women and men in all spheres and structures of government as well as in the workplace, the community and family. Given the mandate given, the specific objectives of the National Gender Policy are to:

- Create an enabling policy environment for translating government commitment to gender equality into reality.
- Establish policies, programmes structures and mechanisms to empower women and to transform gender relations in all aspects of work at all levels of government as well as within the broader society.
- Ensure that gender considerations are effectively integrated into all aspects of government policies, activities and programmes
- Establish an institutional framework for the advancement of the status of women as well as the achievement of gender equality.
- Advocate for the promotion of new attitudes, values and behaviour, and a culture of respect for all human beings in line with the new policy.
- Strengthening the voice of women in civil society, in parliament and in other legislatures who have already made a visible impact by challenging gender-blind laws and policies.
- Enhancing the work that is already being undertaken by the Ministries of Women Affairs and the National Centre for Women Development at the national, state and local government levels and those of other development agencies committed to issues of women empowerment, gender equality and equity for all.
- Guide the development of the National Gender Action Plan (NGAP) (National Gender Policy, 2006).

Notwithstanding the existence of the 2006 National Gender Policy and its elaborateness in identifying and suggesting ways of addressing gender parity in Nigeria, discrimination against women and girls both in the public and private spheres continues unabated. The female gender continues to be underrepresented despite the stipulations of the law which provides for a maximum of 60% and a minimum of 30% representation for either sex (Kemi and Jenyo, 2016). This provision became imperative because of the Beijing Conference which stipulated that 30% of public seats and positions should be reserved for women (Leach, Mehta and Prabhakaran, 2016). Nigeria records an increase of 78% progress in women's election into public offices spanning from 1999 - 2007 (Iwuchukwu, 2013).

Thus, the Nigerian government in 2021 resolved to revisit and review the 2006 National Gender Policy with the aim of redressing the nation's challenges as it concerns addressing gender imbalances in public and private life. This was coming twenty-six years after the resolutions of the Beijing Plan of Action where the Nigeria government had pledged along with other member-nations of the UN to stand up for women. As a result, the government adopted the revised National Gender Policy (2021 - 2026) as a framework for improving gender relations so as to achieve national growth and socio-economic development in both private and public sectors (National Gender Policy, 2021).

Consequently, the revised policy is founded on the following prominent tenets:

1. That the promotion and protection of women's rights as human rights, provision of social buffers and safety nets, social justice, and equity are critical to national cohesion, growth, and stability.
2. That the peculiarity of the needs of women and girls, as distinct from men and boys, are demonstrably not homogeneous, originate from varying circumstances and therefore demand distinct policy responses at



sector and sub-sector levels.

3. Gender policy is central to the achievement of overall national development goals, objectives, and targets on many fronts and from both the macro to the microeconomic levels as gender equality is a driver of growth and good governance.
4. The cooperative interaction of all stakeholders including government, private sector, civil society organizations, traditional and religious leaders, community-based organizations and development partners at all levels is required to drive effective implementation of the policy.
5. That implementation shall build existing structures and draw on international policy frameworks, protocols, experiences and practices including affirmative action (National Gender Policy, 2021).

The Gender Policy upholds the importance of gender equality and inclusion, not only as a basic human right but also as a strategic approach to alleviate poverty and improve the standard of living, implement sustainable development, and promote good governance and public accountability. As stated in the National Gender Policy, (2021), “gender equality is crucial for socio-economic development as well as the attainment of the Sustainable Development Goals, including the principle of 'leave no one behind', and the African Agenda 2030, 'the Africa we want', with a central point of view on gender equality, and empowerment of the African woman in the new economic age”. Thus, having a National Gender Policy reviewed periodically to address the growing demands of gender relations and inclusions in the necessity of successful implementation of sustainable development (Kura and Yero, 2013).

### **Sustainable Development Goals Implementation In Nigeria From A Gender Perspective**

The concept of sustainable development has been an issue of scholarly discourse for decades and did not become a global initiative until the Brundtland conference in the 1980s (Loewe and Rippin, 2015). The ensuing four decades saw the concept of sustainable development progress into an urgent and obligatory measure that needed a global action plan and policy direction for its implementation. The sustainable development movement recognized the importance of gender in actualizing its agenda for a safe and secured world for the present and future generations. Thus, in 2012, gender equality was adopted in the document of the United Nations Conference on Sustainable Development titled: “The Future We Want”. Abolade (2021) observed that, amongst other things, the document recognized the importance of gender equality and women's empowerment across the pillars of sustainable development namely, social, economic and environmental.

In September 2015, the nations of the world met under the umbrella of the United Nations (UN) in New York and adopted the Sustainable Development Goals (SDGs) which became the successor framework to the defunct Millennium Development Goals (MDGs) (Ighobor, 2015).

Unlike the MDGs, which concentrated largely on social outcomes while key development priorities were absent, the SDGs adopted an all-inclusive approach. It focused on the challenges faced by all nations and promoted cooperation between the private and public sectors in the execution of the goals. The SDGs were made up of 17 goals and 169 targets. However, gender was given its pride of place in the SDGs as a key goal in the actualization of sustainable development. It represented SDG 5 which was stated as to achieve gender equality and empower all women and girls (Loewe and Rippin, 2015).

Nigeria joined the rest of the world in implementing the SDGs on the kickoff date of January 1st, 2016. Below is a

table showing the performance indicators as it relates to SDG 5:

**Table 1: SDG5 – Gender Equality Performance Indicator from 2018 to 2022**

SDG5 – Gender Equality Performance Indicator	2018	2019	2020	2021	2022
Proportion of women in national parliaments	5.6	5.6	3.6	3.6	7.2
Demand for family planning satisfied by modern methods (% of females aged 15 to 49)	52.3	26.3	42.8	35.6	35.6
The ratio of female -to-male mean years of education received (%)	69.0	68.5	69.7	74.0	74.0
The ratio of female -to-male labour force participation rate (%)	84.3	84.7	84.8	76.9	80.4

**(Sources: Sachs et al., 2018; Sachs et al., 2019; Sachs et al., 2020; Sachs et al., 2021; and Sachs et al., 2022)**

In Table 1, it was shown that there was a decline in the proportion of women in Nigeria who were elected to the legislative arm of government between 2020 and 2021. However, women's representation rose in 2022, signifying an increase in women's involvement as legislators in the country. This can be alluded to the point raised by Uwa, Anegbode and Daudu, (2018) that following the wake of the millennium and the 2015 general elections that many women have risen to the challenges of the time by vying for and assuming leadership positions in both politics and religion.

Also, the figure above showed about 50 per cent decline from the application of satisfactory modern methods in family planning between 2018 and 2019. By 2020, the practice of using satisfactory modern approaches to family planning significantly increased but fell by 2021 and remained constant going into 2022.

In terms of the data on the ratio of female-to-male mean years of education, there was a decline between 2018 and 2019. But in 2020, there was an increase in the ration of female to male mean years of education, which continued to rise in 2021 and stabilized in 2022.

For the data on the ratio of female-to-male labour force participation rate, the years through 2018 to 2020 experienced increase in terms of women's involvement in employment. However, in 2021, there was a decline in women's participation in the workforce and employment. But in 2022, women's involvement in labour increased significantly.

From the foregoing, it is apparent that Nigeria's poor implementation of the SDGs is reflected on the poor performance indicators of SDG 5. Though the United Nations and affiliate agencies adopted several conventions and declarations for the global promotion and advancement of gender equality, it remained elusive for millions of women around the world, especially in less developed countries. In Nigeria, for instance, the female gender has continued to experience discrimination, gender-based violence, denial of their sexual and reproductive health rights, and so on (Archibong, Bassey and Nwagbara, 2018).

## THEORETICAL FRAMEWORK

Numerous feminist theories and perspectives have emerged over the decades to explain the issue of gender inequality in the contemporary world. These theories include Liberal Feminism, Classical Marxism, Radical Feminism, Socialist Feminism, Eco-Feminist Perspective, Feminist Environmentalism and so on. However, this work adopted the eco-feminist theory in analysing this problem of gender inclusion in pursuance of sustainable development in Nigeria.

### Ecofeminist Theory

The ecofeminist theory arose as a counterculture in the 1970s, with proponents such as Vandana Shiva, Maria Mies, Ynestra King, Bina Agarwal and so on (Aguinaga, Lang, Mokrani and Santillana, 2013). It condemned the degrading association that the patriarchy attached between women and nature. It also criticized the left-wing movements for not taking this into account and questioned the paradigm of progress of “real socialism” and movements within the communist parties.

The Ecofeminist theory which is also referred to as the Women, Environment and Development perspective posits that there is a natural link between women and the environment as both are involved in the creation of life (Pati, 2006). The post-colonial development of less developed countries like Nigeria was characterized by capitalism and patriarchy which exploited both nature and women's labour. Because of this linkage between women and nature as well as their dual exploitation, proponents of this theory of feminism argued that women have a greater interest in ending domination over nature and their own lives (Leach et al., 2016).

Ecofeminists see the patriarchal dominance of women by men as the prototype of all domination and exploitation in various hierarchical, militaristic, capitalist, and industrialist forms (Pati, 2006). They point out that the exploitation of nature has gone hand in hand with that of women, and the ancient association of women with and nature links women's history and the history of the environment and is the source of natural kinship between feminism and ecology (Leach, Mehta and Prabhakaran, 2016). Therefore, ecofeminists see female experiential knowledge as a major source for an ecological vision of reality.

Gaard and Gruen (in Zein and Setiawan, 2017) argued that the ecofeminism framework is based on four conventions:

1. The mechanistic materialist model of the universe that resulted from the scientific revolution and the subsequent reduction of all things into mere resources to be optimized, dead inert matter to be used.
2. The rise of patriarchal religions and their establishment of gender hierarchies along with their denial of immanent divinity.
3. Self and other dualisms and the inherent power and domination ethic it entails.
4. Capitalism and its claimed intrinsic need for the exploitation, destruction and instrumentalization of animals, the earth and people for the sole purpose of creating wealth.

Ecofeminists propose that these four issues have created a divorce between nature and culture which has caused some of the ills that have befallen the earth and its sustainability of life. Arguments tracing a universally caring attitude of women toward nature fail to convince in the face of varying behaviour across classes, regions and contexts. Urban women who use little firewood or fodder, and women from rich peasant households who can obtain much of what they need from family land, have a very different dependence on and hence relationship with communal forests than do poor rural women (Pati, 2006)

Following the ecofeminist paradigm, this study addresses the content of the female gender's input towards sustainable development. Ecofeminists are chosen as the theoretical basis for this study because they link femininity with nature, which sustainable development seeks to preserve. Sustainable development is basically aimed at ensuring that nature's resources are not eroded in the quest for man's advancement. As a social movement, Kronlid, (2003) defined ecofeminism as “the community of women that are engaged in restorative and preservative work”. Thus, ecofeminism proposes that there is a link between gender inclusion and sustainable development.

The ecofeminist theory is concerned with equality, freedom, and equal opportunities between men and women in all facets of life in Nigeria. By estimates, the Nigerian female population is almost equal to that of the male population (49.46 % in 2022) (Ugwuanyi and Formella, 2022). As a result, relegating the female population to the background is detrimental to the attainment of the SDGs. The experience in the Nigerian democratic system reflects the female gender position in society. Despite having a population size almost the same as men, women in politics account for less than 7 per cent (6.7 per cent) of national lawmakers (Ajemba, 2023). Feminist theory therefore points out that the diversity of beliefs and practices of the patriarchal society that Nigeria inhibits it from attaining its full potential. This poses a threat to the successful implementation of SDGs.

From the standpoint that environmental problems such as climate change and degradation threaten man's survival and sustainability, it is therefore proposed in this study that ecofeminist theory is ideal for analyzing the issue. Öztürk, (2020) inserted that ecofeminism holds the view that “environmental problems and women's issues are interrelated”. This perspective is explained by the fact that ecofeminism holds a variety of views of nature, kinds of social constructivism and contextualism, and conceptions of values and of the self, and from the presumption that this variety reflects the reality of environmental problems (Kronlid, 2003).

The biggest criticism of ecofeminism comes back to the idea of essentialism or a belief that things have set characteristics. Some people believe equating women with nature reinforces the dichotomy of gender norms that feminism sought to avoid (Regan, 2020).

## **METHODOLOGY**

This qualitative research tool was utilized in this study to examine the implementation and challenges of the SDGs to about gender inclusion in Nigeria. Therefore, the data adopted in the study were obtained from secondary sources such as books, journals, magazines, conferences seminar papers and newspapers.

## **GENDER ISSUE CHALLENGES AFFECTING THE IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT IN NIGERIA**

Asides the National Gender Policy, the Nigerian governments have embarked on other initiatives which were proposed to tackle gender issues in development such as affirmative action. The principle and practice of affirmative action have become a universally adopted phenomenon in the pursuance of development. The principle of affirmative action impinges on several countries of the world to respect and sustain the rights of vulnerable groups based on their orientation, religion, race, creed and most especially gender (Pati, 2022). Make sure you discuss the gender issues and problem in Nigeria before discussing the provisions of the law.

Nigeria, recognizing the paramount importance of affirmative action has taken a cue from best international practices to promote the involvement of women in their pride of place in ensuring development in society. The

role of gender inclusion is recognized as necessary in enhancing democracy and democratic survival in Nigeria in the current dispensation and beyond (Ugwuanyi and Formella, 2022).

Nigeria, by its very nature as a less developed country, has the challenges and limitations that are peculiar to countries of its kind. These challenges are by no means exhaustive. However, they are categorized under the sub-headings below:

### **Male-dominant culture**

The central culture that permeates the Nigerian society is male-dominated male dominated. This male-dominated culture accords women an inferior position in society. The patriarchal nature of male hegemony is embedded, obscured and protected within traditional institutions and structures held in abeyance and relative utmost sacredness (Makama, 2013).

A major challenge to the task of executing gender-sensitive and gender-equality policies in Nigeria, therefore, is the patriarchal cultural norms, attitudes and practices, which have been accepted as the natural order of things (Makama, 2013). This culture is still deep-seated in society, and it is demonstrated both consciously and unconsciously, irrespective of the general drive for a meaningful change in gender relations through policy initiatives and actions as well as sundry international conventions and accords to which Nigeria is a signatory (Ugwuanyi and Formella, 2022).

### **Corruption and Bad Governance**

Corruption is the foundation of and the gateway to bad governance. Corruption which is the misuse of entrusted power for private benefits, has become the order of the day in Nigeria to the extent that it has become the culture (Anyalebechi, 2016). Corruption has become so endemic, institutionalized and structural that it has a holistic effect on governance. It pollutes and undermines the government's intentions towards the economy, education, employment, and other areas of society that are critical to the actualization of an egalitarian society that ensures gender equality (Anyalebechi, 2016).

### **Inadequate human capacity**

Human capacity building and utilization have been proposed as the missing link in Nigeria's developmental strides. Despite the huge human resources available to Nigeria, the quality of human capacity has been grossly inadequate. The inadequateness of human capacity has severely affected the way public resources, programmes, and projects are formulated, analysed and implemented for the accomplishment of national development goals (Iwuchukwu, 2013).

### **Economic Discrimination**

The major factor that contributes to uneven development and feminization of poverty is gender inequalities within the overall society, including all sectors, and this is reflected in the wide disparities between women and men (Ejumudo, 2013). Over 65% of women are projected to be among the 70% of the population estimated to be living below the poverty line (Adeyanju, Bamigbade and Ajayi, 2020). Men have greater access to secured and high-paying employment. The capacity of women and men to contribute to the economic growth of the country is

affected by the disparities in economic privileges (Ejumudo, 2013).

### **Legal and Human Rights Inconsistencies**

As in most countries, Nigeria is legally regulated by a body of laws that govern major public and private relationships. For example, the issue of marriage is regulated by either Sharia law, statutory law, common law or customary law system (Adeosun and Owolabi, 2021). The manner through which such laws are interpreted and applied frequently varies and are highly inconsistent and in most cases is subjective to personal considerations, mostly when it has to do with the female gender. Kangiwa (2015) noted that in most cases, these laws and acts are interpreted not to favour the protection of the rights and interests of women in society.

### **Gender-Based Violence**

In recent times, gender-based violence has become a major issue not only in Nigeria but in the whole African continent. This reflects the extent to which women's rights are threatened. It also resulted in a situation where women were not able to make a case on many issues concerning and affecting their lives. Violence, particularly domestic violence and rape against women has become a common occurrence in contemporary society (Raheem and Garba, 2017). The cultural practice of female genital mutilation is a violation of basic rights and constitutes a major lifelong risk to women's health. This harmful traditional practice is meant to control women's sexuality, but it has led to great suffering among women in Nigeria (Raheem and Garba, 2017).

### **Absence of Political Will**

Oloyede (2016) pointed out that the fact that the higher levels of government have women grossly misrepresented shows that the drive towards creating a gender-friendly, responsive, equitable and egalitarian society is mere lip service. As a result, all efforts to ensure that the gender gap is reduced would be an exercise in futility except there is top-down holistic support from all levels or tiers of governance, particularly the Federal government (Oloyede, 2016).

### **Conclusion**

Given Nigeria's position on gender equality and the implementation of the SDGs, the study concludes that Nigeria is lagging far behind. Where it matters most in scoring high on gender equality indicators, especially women's representation in politics and government, Nigeria has scored low. Therefore, there is a consistency between poor gender inclusion practices and low SDG ranking in Nigeria.

As the clock ticks towards the deadline for the implementation of the SDGs, Nigeria is faced with the reality of failing to attain the global goals of sustainable development. Therefore, there is a need for urgent steps to be taken to put Nigeria back on track. The study suggests the following steps to be taken to overcome the challenges of gender inclusion and SDGs implementation in Nigeria:

### **Mental Restructuring**

Gender education has not permeated at all levels of the populace, even among the policymakers. Gender issues are mostly viewed as exclusively about women trying to upstage accepted norms and values of marriage, family and religion. The attainment of gender equality is therefore in a negative light and overtly or covertly resisted by

the majority, including policy makers. Therefore, there is a need for mental restructuring.

### **Policy Articulation and Execution**

The leaders who are charged with the responsibility for policy articulation and execution need to demonstrate the political will towards enforcing gender equality. They need to develop positive attitudes to gender issues and equally promote effective policy frameworks that will actively bring about prompt implementation of gender equality programmes across all levels of government and in the private establishment in the country. There should be a top-bottom approach in gender inclusiveness which would provide the exemplary leadership necessary for Nigeria to meet the target for Agenda 2030.

### **Recognition of Women's Productivity**

The government should endeavour to accord the necessary recognition to women's productivity capacity in all sectors of humanity to encourage them to see themselves as a major stakeholder towards the nation's building in Nigeria. There should be nationwide legislation that stipulates private and public organizations to have the approved quota for women's participation in leadership and management positions.

### **Eradication of Cultural Discrimination Against Women**

Another dimension of gender-based marginalization can be perceived in the unwritten norms and traditions which shape and influence organizational culture and practices. Nigerian government must put appropriate legislation in place to address all the aspects of discriminatory cultural policies by all the ethnic groups in Nigeria so that the SDGs aimed at encouraging women empowerment would not be impeded.

### **Rights of Enjoyment**

Women's rights have been systematically undermined by the Nigerian legal systems which made many legal instruments to be discriminatory and gender blind.

Consequently, the existence of gender-sensitive provision in the Nigeria constitution may not enhance any progress at the level of state governance, suggesting that interventions focused on the state level may be more effective. This reality needs to be better acknowledged by programme planners and implementers.

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## 5. The Influence of Stress and Depression on Quality of Life among Residents of Cement-Producing Communities in Ogun State

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### Abstract

Pollution of the environment increases because of growth in urbanisation and industrialisation in the West African region and the sustainability of the environment is dependent on the activities of people living in it which have implications on individual quality of life. The cement manufacturing industry, being one of the fastest growing in the region, has played a role in the crucial release of harmful and toxic pollutants not only to the environment but also to human health, causing life-threatening diseases that have in turn resulted in depression affecting the quality of life of residents in the area. Data were collected from 350 participants and residents in Ogun state within a 5 km radius of the cement factory. They analyzed using a sample t-test on stress & depression while multiple linear regression on the joint influence of the predictors on quality of life. The results indicated that stress had a significant impact on the quality of life of residents in cement-producing areas  $t(345)=6.067; p<.05$  and depression negatively influences the quality of life of the residents' well-being in the producing area  $t(339)=(5.86) p,<.05$ , however, both stress and depression jointly influence the quality of life [ $F(3,333) =31.115; p<.05$ ]. The study shows that pre-existing deteriorated health conditions because of the stressors from the environment and the negative impact of pollution from industry brings about poor quality of life among residents in the cement-producing area. The study concluded that stress and depression have an impact on the quality of life of residents living in the cement-producing area.

**Keywords: Cement-, Stress, Depression, Pollution, Quality of Life**

### Introduction

Quality of life (QOL) is defined by the World Health Organization as "an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" (WHO, 2020).

Quality of Life within the field of health is the perceived quality of an individual's daily life, an assessment of and evaluation of how their well-being may be affected positively or negatively over time by a disease or disability this includes all emotional, social and physical aspects of the individual's life (WHOQOL, 2020). With this context, we are examining the quality of life as an overall sense of well-being, assessed based on basic infrastructural development, safety and security, environment, physical and mental health, livelihood, social amenities, and transport facilities which are all standard indicators of the level of development and livelihood strategies including their availability (Gregory, Johnson, & Pratt, 2009)

Hence from the moment we encounter our physical environment, we can evaluate how a person feels and behaves because of activities within it. Stress is not just the feeling of emotional or physical tension we get when we feel frustrated, angry, nervous or under pressure rather Stress is our psychological and physiological reaction to an event or condition that is considered a threat or challenge when we are unable to cope with situations in the environment or life at large (WHO, 2020).

Generally speaking, small amounts of stress can be good for us and motivate us to help us perform in our daily activities. Too much stress can cause physical and mental health problems, especially when we come in contact

with stressors from the environment, (such as chemical, physical or climatic stressors) our body produces a response that leads to emotional and mental symptoms like Anxiety or irritability, from Depression to Panic attacks, Sadness, etc., as a result of continuous exposure to the stress just as much the major depressive disorder can lead to a variety of emotional and physical problems and can decrease one's ability to function at work and at home with signs like trouble sleeping, poor fatigue, poor concentration etc. and being exposed to an environment where there is the high level of industrial pollution will only make the effect on individuals severe.

The activities of industries have caused a wreck to human health and the cement industry contributes significantly to the imbalances in air quality. The key environmental emissions are nitrogen oxides (NO<sub>x</sub>), sulphur dioxide (SO<sub>2</sub>), and grey dust with other emissions such as carbon dioxide (CO<sub>2</sub>) from power generation and emission of Carbon monoxide (CO), (Abeanu, Madsen, Popentiu & Thyregod, 2004). The cement manufacturing industry has played a fundamental role in global economic development with construction constituting major infrastructural aspects worldwide, but its production is a major facilitator to the release of particulate matter. The major pollution problems coming from the cement industry are noise, dust and particulate matter emissions, which are emitted from different spots like raw material grinding, coal mills, clinker cool-in, storage silos, and packaging at almost all the stages of cement manufacturing, there is an adverse impact on the environment. During the blasting of the rocks, there are dust particles which spread into the environment and make it toxic. Along with this, there is noise pollution caused while extraction from the rocks occurs (Aqr, 2011).

However, Pollution of the environment which is caused by a host of human activities, differs in intensity and effect on the population of people living around with Pollution by industries as the major contributor to environmental degradation and biodiversity loss in the West Africa sub-region, especially Nigeria. Thus, a major environmental health challenge affecting everyone in low, middle, and high-income countries Is causing life-threatening ailments leading to ailment resulting into depression. The air pollutants and effluents released into water bodies with apparent water quality deterioration, noise coming from operating machines, and pollution from lime and cement-producing plants are seen as severe instigators of health hazards and life threats, such as Depressive symptoms, negatively affecting crop yields, buildings, and persons residing in the vicinity of these industries, while the Quality of life of residents which aims to capture the well-being in the totality of their existence to which an individual is healthy and comfortable, the cement activities in a residential area has not only disrupted the well-being but also triggered an increase in the prevalence of anxiety, depression with a lowered global life expectancy.

### **Statement of the problem**

In recent years, there has been a growing global concern over pollution, and health hazards of residents of industrial area, this is evident from the moment we step out of our houses when we are greeted with a strange sight that reminds us that breathing clean air and enjoying suitable environment is more of a distant dream. While good health and environmental sustainability are essential to sustainable development, the 2030 Agenda reflects the complexity and interconnections with an increasing focus on the sustainability of the environment. Nigeria has the largest cement industry in West Africa, with an aggregate capacity of 58.9 million metric tonnes (MMT) per year Cement is not only common rather it is extensively used as an adhesive in the construction industries which is employed on highways, houses, bridges, commercial establishments, and flyovers makes its impact critical on the environment. (Andrew, 2018). The notion of cementing residents' health implies residents' ability to respond to environmental factors which helps to maintain a balance between self and the people of the environment. As desirable as this development of industrial activities is, it has become an albatross not to itself but to the people as well.

While there are studies that indicate that high levels of pollution can impair affective responses, decrease muscular coordination, and cause hearing problems others reported mood change and reduce life span.

Consequently, addressing this challenge of polluted industrialized communities in maintaining the Goals of sustainable cities and communities is about making cities and human settlements inclusive, safe, resilient and sustainable. Smith and Turner (2020) highlighted the adverse effects of industrial pollution on health including respiratory illnesses, cardiovascular diseases and exacerbation of pre-existing health conditions. Studies on urban sustainability and pollution control in industrial cities emphasize the importance of clean energy initiatives to reduce the environmental impact of industrialized communities (Smith and Turner, 2020). Another study on Sustainable urban development and industrial pollution concluded that a combination of cleaner technologies, strict pollution regulations and public engagement has helped cities maintain their industrial activities while promoting sustainability (Chen & Zhao, 2019). This paper focuses on the influence of stress and depression on the quality of life of residents in cement-industrialized areas.

### **HYPOTHESIS**

1. Influence of Stress on quality of life among residents of cement factories in Ogun State.
2. Influence of depression on quality of life among residents of cement factory in Ogun state.
3. There will be a joint influence of stress and depression on the quality of life among residents of cement factories in Ogun state.

### **METHODS**

#### **Participants**

The target population for this study are the residents of Lafarge WAPCO cement factory in Itori Ewekoro and its other plant in Sagamu/ Ikorodu in Ogun state within a 5km radius from the cement factory site. The choice of these categories of residents was informed by several important facts: to represent the typical communities in which industrialization has expanded and how activities of the industries affect them significantly, easy accessibility because residential homes are situated a few kilometres away from industrial factories where they form a large concentration of population in the area. While some factors may be responsible for influencing the quality of life, numerous factors also affect an individual's mental health which this study tends to find, since there are correlation between proximity to industrial areas and the prevalence of respiratory illnesses and depression contributing to quality of life. The study concentrated on stress and depression on quality of life which are the independent variables used to assess its impact on quality of life in a cement-polluted environment. Hence, a non-probability sampling technique was used to select a total of 350 respondents from 11 communities after geographically mapping out the distance of 5km from the cement industries. A total of 209 were examined in 6 communities around Sagamu, and 141 respondents from 5 communities in Ewekoro.

#### **Design Instruments**

A quantitative survey research design was employed using three standardized questionnaires to elicit information from the participants. It is divided into four sections as Socio-Demographic data form, the WHO-quality of life scale with a Cronbach's alpha of 0.78, the perceived stress scale with a Cronbach alpha of 0.81 and the depression scale with a value reliability of 0.87.

### **Procedure For Data Collection**

The participants had their confidentiality and voluntary participation assured while ethics in research were followed. The questionnaire was distributed with the aid of research assistants at the participants' households and workplaces within the radius of cement-producing factories to yield valid results.

## METHOD OF DATA ANALYSIS

The demographic information of respondents was analysed using descriptive statistics presented in frequency counts and percentages while a sample t-test was used to analyse the hypothesis to determine the influence of stress and depression and multiple regression analysis was used to determine the joint influence of both variables.

## RESULTS

### Respondents' Characteristics

Table 1 presents the distribution of respondents' characteristics. The result showed that there were 179 (51.0%) males while there were 171 (49.0%) females. With regards to their age, 120 (33.4%) were 19 years and below, 193 (30.8%) were 20-29 years, 79 (24.3%) were 30-39%, 24 (6.8%) were 40-49 years, 16(4.4%) were 50-59 years and 1 (0.3%) was 60 years and above. On marital status, 216 (62,6%) were single, 125 (35.1%) were married and 9 (2.2%) were divorced, while based on the highest level of education, 9 (3.2%) were educated up to primary school, 207 (57.8%) up to JSCE/SSCE/O'Level, 64 (19.1%) had NCE/OND/Technical College, 56 (16.1%) HND/B.Sc., 10 (2.7%) had post-graduate, and 2 (1.0%) declined to indicate their age. The distribution of respondents by occupation showed that 70 (20.8%) were into business/trading, 42 (11.4%) were artisans, 43 (12.4%) were professionals, 19 (4.7%) were civil servants, 9 (4.2%) were sales/service providers, 140 (38.9%) were students, 2 (0.5%) were unemployed, 19 (5.7%) belonged to employment categories and 6 (1.5%) declined to indicate their occupation. The income distribution of the respondents was as follows: 119 (35.1%) were earning below 20,000, 68 (19.1%) earned 20,000-50,000, 18 (5.4%) earned 51,000-100,000, 26 (7.2%) earned 100,000 and above while 119 (33.2%) declined to disclose their income. Finally, with regards to their employer distribution, 36 (9.4%) were civil servants, 1 (0.5%) were self-employed, 174 (53.3%) were employed in private organisations, 126 (32.5%) were not employed and 12 (3.0%) declined to indicate their employer.

		(n=201)		(n=149)		(n=350)	
		Freq.	%	Freq.	%	Freq.	%
Gender	Male	109	54.2	70	47.0	179	51.0
	Female	92	45.8	79	53.0	171	49.0
Age	19 years and below	87	45.5	33	23.4	120	33.4
	20 - 29 years	45	23.6	48	34.0	193	30.8
	30 - 39 years	40	20.9	39	27.7	79	24.3

	40 - 49 years	12	6.3	12	8.5	24	6.8
	50 - 59 years	7	3.7	9	6.4	16	4.4
	60 years and above	0	.0	0	.0	0	.3
Marital Status	Single	139	69.2	77	51.7	216	62.6
	Married	59	29.4	66	44.3	125	35.1
	Divorced	3	1.5	6	4.0	9	2.2
Highest Level of Education	Primary School	6	3.0	3	2.0	9	3.2
	JSCE/SSCE/O'Level	124	62.0	83	55.7	207	57.8
	NCE/OND/Technical	30	15.0	34	22.8	64	19.1
	HND/B.Sc.	31	15.5	25	16.8	56	16.1
	Postgraduate	7	3.5	3	2.0	10	2.7
	Declined to indicate	2	1.0	1	.7	3	1.0
Occupation	Business/Trading	32	15.9	38	25.5	70	20.8
	Artisan	19	9.5	23	15.4	42	11.4
	Professional	25	12.4	18	12.1	43	12.4
	Civil servant	10	5.0	9	6.0	19	4.7
	Sales/Service provider	4	2.0	5	3.4	9	4.2
	Student	96	47.8	44	29.5	140	38.9
	Unemployed	2	1.0	0	.0	2	.5
	Others	9	4.5	10	6.7	19	5.7
	Declined to indicate	4	2.0	2	1.3	6	1.5
Income	Below 20,000	68	33.8	51	34.2	119	35.1
	20,000 - 50,000	33	16.4	35	23.5	68	19.1
	51,000 - 100,000	11	5.5	7	4.7	18	5.4
	100,000 and above	13	6.5	13	8.7	26	7.2
	Declined to disclose	76	37.8	43	28.9	119	33.2



Employer	Civil service	20	10.0	16	10.8	36	9.4
	Self-employed	1	.5	0	.0	1	.5
	Private organisation	88	43.8	86	58.1	174	53.3
	Not employed	86	42.8	40	27.0	126	32.5
	Declined to indicate	6	3.0	6	4.1	12	3.0

### Hypothesis one

The first hypothesis stated that stress will have a significant impact on the overall quality of life of residents in cement-producing areas in Ogun state.

The independent variable (stress) consisted of two categories (low and high stress) while the dependent variable was measured on a continuous scale. Thus, the hypothesis was tested using an independent samples t-test at a 0.05 level of significance. The result is presented in Table 2

**Table 2 Independent samples t-test on impact of Stress on overall Quality of Life**

<i>Stress</i>	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>t</i>	<i>df</i>	<i>p</i>
Low stress	141	101.1	12.4	6.067	345	0.001
High stress	206	92.5	13.4			

The result showed that there was a significant difference in the quality of life of respondents with low and high stress [ $t(345) = 6.067; p < .05$ ]. Respondents with low stress (mean = 101.1; s.d. = 12.4) reported a higher quality of life in comparison with those who had high stress (mean = 92.5; s.d. = 13.4). Thus, the hypothesis that stress will have a significant influence on the overall quality of life of residents in cement-producing areas in the Ogun State is accepted.

### Hypothesis two

The second hypothesis stated that depression will have a significant influence on the overall quality of life of residents in cement-producing areas in Ogun state.

The independent variable (depression) was measured on a categorical scale which comprised two categories (no risk of clinical depression and risk of clinical depression) whereas the dependent variable (quality of life) was measured on a continuous scale. Hence, the hypothesis was tested using an independent samples t-test at a 0.05 level of significance. The result is presented in table 3:

**Table 3 Independent Samples t-test of depression on quality of life**

<i>Depression</i>	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>t</i>	<i>df</i>	<i>p</i>
No risk of clinical depression (mild)	95	102.4	13.4	5.86	339	0.001
Risk of clinical depression (chronic)	246	93.2	12.9			

The result showed that there was a significant difference in the quality of life of respondents based on their level of depression [ $t(339) = 5.86; p < .05$ ]. Further examination of the result showed that respondents with no risk of clinical depression had higher scores in quality of life (mean = 102.4; s.d. = 13.4) compared with those who had a risk of clinical depression (mean = 93.2; s.d. = 12.9). Thus, the hypothesis that depression will have a significant influence on the quality of life of respondents in cement-producing areas is accepted and it was concluded that depression will significantly predict the quality of life of residents in cement-producing areas.

### Hypothesis three

The third hypothesis stated that stress and depression will have a significant joint impact on the quality of life of respondents in cement-producing areas.

The hypothesis was tested using multiple linear regression analysis. The result is presented in Table 4

**Table 4: Multiple linear regression of influence of stress and depression on quality of life of cement-producing respondents.**

R	= 0.468				
R <sup>2</sup>	= 0.219				
Adj. R <sup>2</sup>	= 0.212				
S.E.E.	= 12.188				
ANOVA					
	Sum of Squares	Df	Mean Square	F	p
Regression	13866.335	3	4622.112	31.115	.001
Residual	49467.196	333	148.550		
Total	63333.531	336			

Coefficients					
	B	Std. Error	Beta	T	p
(Constant)	80.359	6.241		12.875	.001
Stress	.834	.133	.333	6.267	.001
Depression	-.193	.092	-.123	-2.090	.037

The model significantly predicted quality of life [ $F(3, 333) = 31.115; p < .05$ ]. The model predicted 21.9% of the variation in the dependent variable. All the two predictors significantly contributed to the model variation. Stress contributed positively [ $\beta = 0.834; t = 6.267; p < 0.05$ ] implying that a higher level of stress led to higher quality of life among the respondents and depression [ $\beta = -0.193; t = -2.090; p < 0.05$ ] contributed negatively to the model. The hypothesis that stress and depression will have a significant joint impact on the quality of life of respondents in cement-producing areas is accepted and it can be concluded that stress and depression will significantly impact the quality of life of residents in cement-producing areas.

## DISCUSSION

The study examined the level of stress and depression on the quality of life of residents. The first research question in the study was what impact stress has on the quality of life of residents in Ogun State. Stress was a contributor to the level of quality of life of both cement-producing communities as shown in the distribution of stress among respondents, where the level of stress in producing cement areas shows that their level of stressors can be attributed to environmental factors such as pollution and noise which implies their mental state.

A review of quality of life studies in Nigerian patients with psychiatric disorders in 6 studies which employed the generic WHO quality of life scale reveals that quality of life is associated with socio-demographic factors like marital & employment status, and social support, while poor quality of life was associated with illness-related factors such as co-morbid medical problem, presence of depressive symptom and non-adherence to medication (Aloba, Fatoye, Mapayi and Akinsulore, 2013).

Findings from the study show that stress has a persistent positive influence on quality of life as the respondents' high level of stress is directed at facing the challenges encountered in the environment. According to the correlations of the variables, it indicated that a higher level of stress shows a poorer quality of life. Chishohm (1996) identified the effects of stress is lack of concentration, memory loss and errors in judgment. Krohe (1997) affirmed that stress has its implications for physical and mental well-being and when one is unable to cope with it only leads to psychological issues such as depression and anxiety. Oladepo & Oladejo (2011) findings contradict this study, their study affirmed that prolonged and continuous exposure to a polluted environment along with the noise from industrial activities can contribute to elevated stress. It activates many of the body's organs and eventually leads to physical and mental exhaustion because it decreases the function of the system, strains the

body and consequently leads to illness, or even prolongs the illness we already have. Further findings from Akinboye (2002) study state that both major and minor stress contributed to the dimensions of quality of life the observations from the results in the study show that moderate stress is most times necessary and required for motivation, creativity and facing challenges to carry on daily activities which positively influence an individual quality of life and in support of the current study while stress only become negative when it is prolonged for an extended time then it will have an implication one's health. Akinboye, *et al.* (2002) further state that one's perception of stress determines the effect of stress, the way we perceive, interpret and appraise stressful events will determine its impacts, which aligns with this study that residents do not attribute their quality-of-life level to stress, hence stress significantly influences the quality of life.

The second hypothesis also reveals the level of depression among the producing proving that a high number of respondents in cement-producing communities are at risk of clinical depression (chronic). Depression among non-producing communities' respondents may be in line with emotional, and social problems experienced meanwhile depression in cement is more of an environmental concern, where emissions of harmful substances is likely to alter brain function causing mood disorders, defects and other disabilities, yet their risk of clinical depression (mild) is less

However, results from the findings show that depression negatively influences the quality of life of residents in the cement-producing area, it shows that the higher the level of depression the poorer the quality of life. The findings support Yusuf, Nuhu, Olisah (2013) study which says that emotional distress is experienced by people who suffer a certain ailment in the case of epilepsy, which manifests itself in the form of phobia, or panic disorder thereby compromising the quality of life at the level of psychosocial functioning. Another study by Aloba, Fatoye, Mapayi and Akinsulore (2013) on quality-of-life studies among Nigerian patients with psychiatric disorders supports the study findings that poor quality of life was associated with illness-related factors.

The third objective was to examine the influence of the two variables and its hypothesis in the study states the negative influence of these variables on physical, and psychological health, social relationships and environment, where higher levels of stress, and depression lead to poorer quality of life. Hence, results from the findings pointed out that as much as the two independent variables have a level of significance in quality of life only depression has a deep root of contributing negatively to the quality of life of residents. Slightly significant stress is necessary but the overreaction of it causes distress which leads to panic disorder.

## **Conclusion**

This study examined the mental health level of how an individual in a perceived polluted community perceives their quality of life. The study indicated that stress, significantly the quality of life of residents, is attributed to individual biological makeup. A certain level of stress (good stress) is required to function in daily life, only continuous stress which is termed chronic could negatively influence quality of life but this is not experienced by the respondents because they see life and their community as something they could bare and cope with without overreactions. Meanwhile, depression influences the quality of life negatively. As expected, individual residents who are anxious develop phobic attacks which result in distress and consequently depression, they perceive their quality of life has been threatened. The higher the level of depression the poorer their quality of life. Depression causes impairment in psychological health, physical health, social relationships e.t.c., which consequently affects their quality of life. Hence, if we are going to achieve a substantial reduction in the global burden of mental health conditions because of an unhealthy environment, we have to address the socioeconomic status and

environmental circumstances that drive them. The balance in individual well-being cuts across all stages of sustainable development goals. Exposure to socioeconomic & poor air quality adversity exerts its influence on mental health across the course of life by paying special attention to air quality and ultimately providing universal access to safe, inclusive and accessible, green and public spaces.

### **Implications**

It is evident from the study that the effects of stressful life events, depression arising from life events and environmental consequences have collective and interactive adverse physical and mental health consequences on residents in polluted areas. For instance, loss of life based on health due to an unprotected environment from pollution hazards leads to mental health problems among residents such as anxiety, depression, post-traumatic stress disorder and a variety of other illnesses

Stress among community residents leads to reduced energy, difficulty in dealing with others and managing occurrences from the environment which is usually accompanied by a feeling of helplessness and powerlessness, the findings revealed that improvement in the quality of the environment will produce corresponding improvement in the quality of life.

The findings demonstrated that maintaining a balance between oneself and the requirements of the environment and avoiding phobic and unnecessary distress are important for mental health and general well-being stating that only stress at a minimal positive level is beneficial for health.

The study therefore serves as an awareness to sensitize Nigeria industries emitting gas and particles during manufacturing to help reduce health hazards and other ailment that might be as a result of inhaling poisonous gas, dust, metal lethal and other chemical particles coming from their industries to the environment.

### **Recommendations**

In meeting with the vision set out in the SDGs: a more flexible, cleaner living environment for the 100 million people who are expected to move to cities over the next 10 years, and for the almost millions of people living in cities today the industries is expected to reduce emission and follow the guidelines set out by environmental protection agency in the country. One of the unique contributions of this study is that it has demonstrated that stress is a necessary determinant and function of quality of life. It is needed to satisfy everyday life and hassle making one fit for environmental challenges, hence it's important to maintain a reasonable level of stress to combat environmental challenges.

From the study, depression is categorically a possible determinant of poor quality of life. This is evidence of how distress and unnecessary phobia in the face of threat could cause, it is therefore expedient for residents to maintain a good mental state level to combat environmental challenges and enhance their quality of life. Also, the findings reveal that the presence of physical health deterioration results in mental imbalance, hence it is suggested that residents should protect themselves from environmental hazards through the use of gadgets such as cyclones, venturi scrubbers, and electrostatic precipitators and equip themselves with information on how to eradicate environmental threats ranging from indoor pollution to outside pollution, specifically refurbishing the environment into a green-nature to trap air pollutant that might be coming from industrial activities and released to the environment.

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## 6. Assessment of the Domestic Water Supply Situation in Peri-Urban Areas Of Lagos State:

### A Case Study Of Epe

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#### Abstract

This study assessed the drinking water quality and associated human health risks in Epe Town, Lagos State, Nigeria as a case study. Available water infrastructures and associated water quality were examined. An assessment of the accessibility of water supply to the inhabitants of Epe Town was also carried out. Three hundred structured questionnaires were administered to gather information about water supply, respondents' daily water usage volume, and the time taken to access water. The research integrates spatial and quantitative analyses of water quality parameters such as pH, EC, turbidity, TDS, DO, Na<sup>+</sup>, and Cl<sup>-</sup> with qualitative assessments of residents' experiences and perceptions regarding water scarcity and its daily-life consequences. The results revealed inadequate water infrastructures, leading to limited access to clean water. Residents face challenges in obtaining water, often investing valuable time and resources in securing this essential resource. The study underscores the implications of these constraints for achieving SDG 3. Moreover, the physico-chemical analysis of underground water demonstrates generally good water quality; but cautions against elevated total dissolved solids (TDS) and dissolved oxygen (DO) levels, which can pose health risks. The study emphasizes the necessity for comprehensive water management strategies and proper infrastructure development to mitigate the negative impacts of water supply on public health, in pursuit of achieving the SDGs.

**Keywords:** Water quality, Sustainable Development Goals, Lagos State, Water supply, Groundwater

#### Introduction

Water's indispensable role in sustaining life and preserving human well-being is undeniable (Akoteyon, 2019; Popkin, D'Anci, and Rosenberg, 2010; UNDP, 2006). Its involvement spans vital functions like temperature regulation, joint and tissue lubrication, and digestive processes (Healthline, 2023). Despite its paramount significance, a considerable segment of the global populace lacks access to safe drinking water. The World Health Organization (WHO) reports that over 2 billion individuals inhabit countries grappling with water scarcity, and no fewer than 2 billion people rely on contaminated water sources tainted with faecal matter (WHO, 2022). This precarious situation fuels the transmission of diseases such as diarrhoea, cholera, dysentery, typhoid, and polio. The intricate interplay between water and human health is underscored by the profound impacts of water quality and availability on health outcomes, alongside strategies aimed at augmenting access to potable water and fostering healthy hydration practices, aligning with the goals of SDG 3.

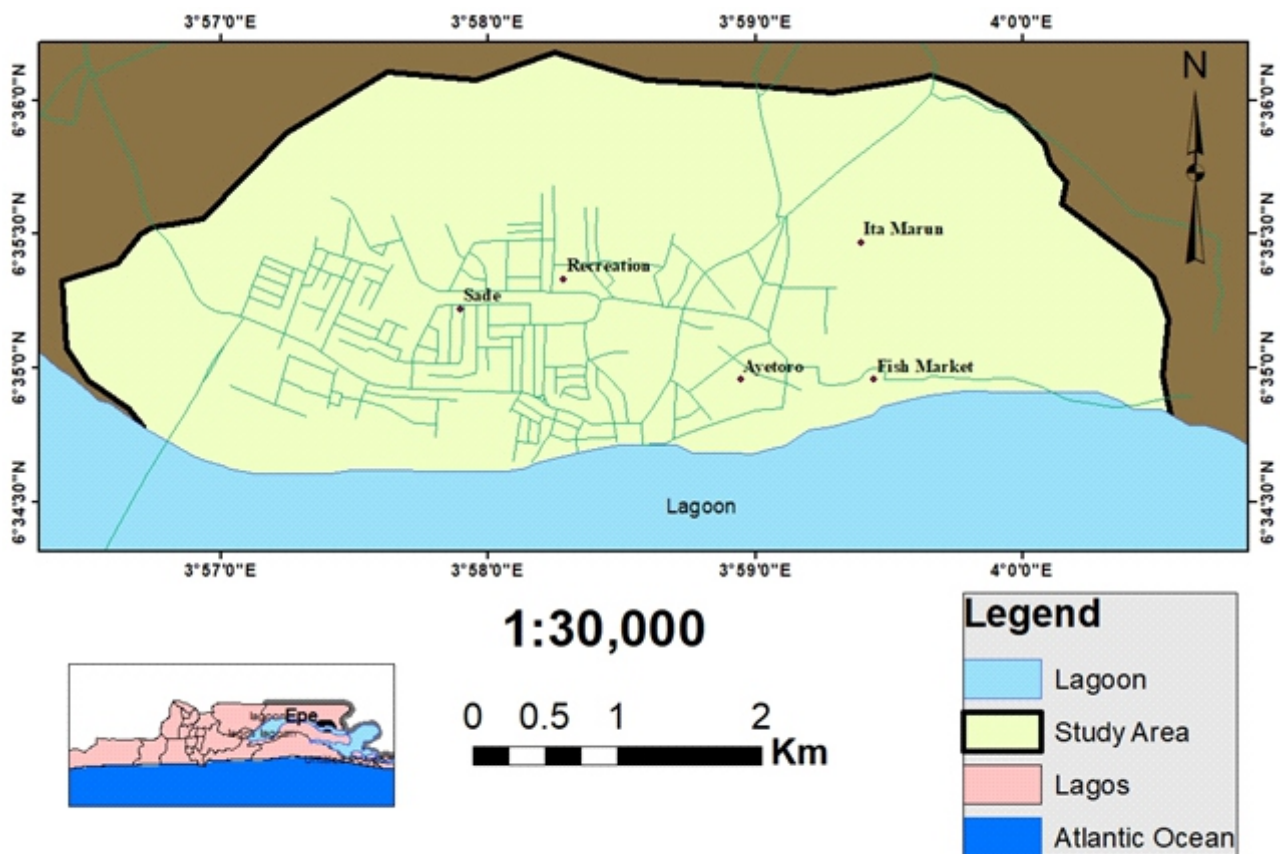
Simultaneously, the surge in urban population and heightened commercial activities may induce a pronounced surge in water consumption, potentially generating a conflict between the supply and demand for water resources, particularly in metropolitan zones (Jenerette & Larsen, 2006). This predicament could be exacerbated

by the deterioration of urban water pollution control measures and a decline in the availability of water resources suitable for human utilisation, further magnifying these challenges (Liang, 2011).

The depletion of the world's available water resources is a mounting concern, aggravated by the rapid escalation of global populations, notably in developing nations like Nigeria. Presently, around 30 countries confront water stress, with 20 of these facing outright water scarcity. Projections indicate that by 2020, the number of water-stressed nations could escalate to 35 (Rosegrant *et al.*, 2002). This predicament stands as a direct contradiction to Sustainable Development Goal 6 (SDG 6), which seeks to ensure the availability and sustainable management of water and sanitation for all. Additionally, based on estimates, a substantial portion of the developing world's populace, amounting to one-third, will grapple with acute water scarcity by 2025 (Seckler *et al.*, 1998), directly impacting progress towards SDG 3 that aims to ensure healthy lives and promote well-being for all. In 2016 alone, inadequate water, sanitation, and hygiene facilities precipitated approximately 1.6 million fatalities on a global scale (Prüss-Ustün *et al.*, 2019). This dire situation starkly contradicts the objectives of SDG 3 and SDG 6, emphasizing the need for clean water and sanitation, as well as good health and well-being.

### Study Area

Epe is situated at approximately Latitude  $6^{\circ} 23' 3''$  North to  $6^{\circ} 44' 0''$  North of the equator and Longitude  $3^{\circ} 35' 43''$  E to  $4^{\circ} 23' 12''$  E of the Greenwich Meridian. Geographically, Epe town is bounded by Ogun State to the north, the Lekki Lagoon to the west, Eti-Osa Local Government Area (LGA) to the south, and Ikorodu LGA to the east (Ogunbajo *et al.*, 2020). It has an average elevation of around 137 feet above sea level.



**Figure 1: Map of the Study Area**  
Source: Authors (2023)

## Method of Study

### Data Acquisition

To assess the water quality and examine the relationship between human health and water supply, purposive and simple random sampling techniques were adopted, and twenty (20) water infrastructures were purposively selected for the study. The water samples were collected, and the following parameters were measured in situ: total dissolved solids (TDS), dissolved oxygen (DO), pH, and electrical conductivity (EC). While Chloride (Cl<sup>-</sup>), Sodium (Na<sup>+</sup>) and turbidity were done in the laboratory. The selected parameters were chosen due to the riverine nature of the study area and based on past research on water quality in coastal areas (Sivaranjani et al., 2015). Dissolved oxygen (DO) was selected to measure the oxygen concentration in the water samples, indicating microbial activity. Total dissolved solids (TDS) were chosen to assess the concentration of dissolved minerals. Turbidity was used to evaluate the quantity of suspended particles in the water, while pH was measured to determine the water's acidity or alkalinity. Electrical conductivity was employed as an indicator of the concentration of dissolved ions in the water. Dissolved ions can include salts, minerals, and other chemicals. Chloride (Cl<sup>-</sup>) and sodium (Na<sup>+</sup>) were tested in Yen and Rohasliney, (2013); Longe and Balogun (2010); ScienceDaily (2007) and Tasoriero et al., (2004).

**Total Dissolve Solid (TDS)/Electrical Conductivity/pH** were measured using a portable combined Electrical Conductivity/TDS/Temperature meter (HM Digital Com - 100). The electrical conductivity meter was standardised with 342ppm sodium chloride calibration solution after the different samples were tested in turn.

**Dissolved oxygen (DO)** The dissolved oxygen of the water sample was determined using a portable Orion 3 DO meter. The DO meter was calibrated with saturated with air after which the different water samples were tested in turn.

**Determination of metals Sodium (Na<sup>+</sup>)** Sample pre-treatment- 100ml of thoroughly mixed water samples was transferred into a beaker and 5ml conc. Nitric acid was added. The beaker was placed on a hot plate and evaporated to dryness. The beaker was then cooled and another 5ml conc. Nitric acid was added. Heating was continued until a light-coloured residue was observed. Then 1ml conc. Nitric acid was added and the beaker was warmed slightly to dissolve the residue. The walls of the beaker were then washed with distilled water. The volume was adjusted to 50ml. Na were determined in the digested samples using an atomic absorption spectrophotometer (Analyst 200 Perkin Elmer AAS).

**Chloride (Cl<sup>-</sup>)** The chloride was determined by the argentometry method. An aliquot portion of water samples was titrated with a standard solution of silver nitrate solution using potassium chromate as an indicator. The colour change at the endpoint was yellow to brick red.

### Results and Discussion

The analysis of Total Dissolved Solids (TDS) revealed a significant and wide variation within the dataset, as indicated by a coefficient of variation exceeding 33% (Table 1). The concentrations of TDS ranged from 10mg/L to 278mg/L, with an average concentration of 133.4mg/L (Table 1). It is worth noting that all groundwater samples taken from Point A to Point T exhibited low TDS levels, which were found to be below the drinking water quality standards set by WHO and NSDQW (Fig. 2). The map (Fig. 3) visually displays the spatial patterns

of TDS concentrations, allowing for identification of areas with higher or lower TDS levels.

TDS primarily consist of inorganic matter and small amounts of organic matter, which dissolve in water. High concentrations of TDS can render water unsuitable for drinking purposes, potentially leading to various health issues such as joint stiffness, arterial hardening, kidney stones, gallstones, and blockages in the body's passages and capillaries through which liquids flow (Rahmanian, 2015). The findings suggest that the water in the study area may contribute to the occurrence of the health problems.

The analysis of groundwater samples reveals a wide range of pH values. The average pH recorded is 1.74, with a standard deviation of 0.65. The minimum pH observed is 0.50, while the maximum is 2.80. The coefficient of variation (CV) for pH is calculated to be 37.41% (Table 1), indicating a moderate level of variability in pH levels. It is important to note that the observed pH levels in the groundwater samples fall significantly below the recommended range of 6.5 to 8.5 pH (Fig. 4) suggested by the World Health Organization (WHO) and the National Secondary Drinking Water Quality (NSDWQ) for drinking water. This indicates that the groundwater samples exhibit an acidic nature. Acidic water can have implications for taste, corrosion, and overall water quality. It may also result in the leaching of metals and other substances from plumbing materials, which can pose potential health risks.

Water with a pH value lower than 6.5 is considered acidic for human consumption and can cause health problems such as acidosis and adverse effects on the digestive and lymphatic systems (Fosu-Mensah, 2016). However, pH has no direct effect on human health, but because it is closely associated with other chemical constituents of water, it is often regarded as having an indirect effect on health (Adesakin et al, 2020). pH changes can also affect aquatic organisms as their metabolic activities are pH-dependent (Kumar et al., 2017).

**Table 1: The physico-chemical analyses of the water were carried out following standard analytical methods (APHA, 1992).**

Name	TDS	PH	EC	D0	Cl	Na	Turbidity
Point A	30.5	2.1	0.03	19.7	16	6.291	2.5
Point B	10	1.9	0.01	10.7	8	3.145	2.2
Point C	28	2.6	0.03	10.6	18	7.077	1.8
Point D	278	0.6	0.4	5.9	12	4.718	2
Point E	172	1.4	2.4	7.9	76	29.88	1.5
Point F	123	1.8	0.17	10.7	56	22.017	2
Point G	181	1.2	0.25	4.6	80	31.453	1.9
Point H	152	0.8	0.21	5.7	72	28.308	1.1
Point I	135	1.8	0.18	6.8	76	30.667	1
Point J	232	0.5	0.32	5.4	100	39.316	2.3
Point K	182	1.7	0.25	6.3	75	29.487	1.7
Point L	190	1.4	0.26	9.8	84	33.026	1.6
Point M	193	2	0.26	10	88	34.598	1.4
Point N	140	2.5	0.19	8.1	77	30.274	1.8
Point O	228	1.3	0.32	7.2	103	40.496	1.8
Point P	116.5	1.7	0.16	4.6	60	23.59	2
Point Q	70	1.8	0.09	4.9	32	12.581	1.2
Point R	93	2.3	0.12	5.6	38	14.94	0.7
Point S	28	2.8	0.03	3.4	19	7.47	0.8

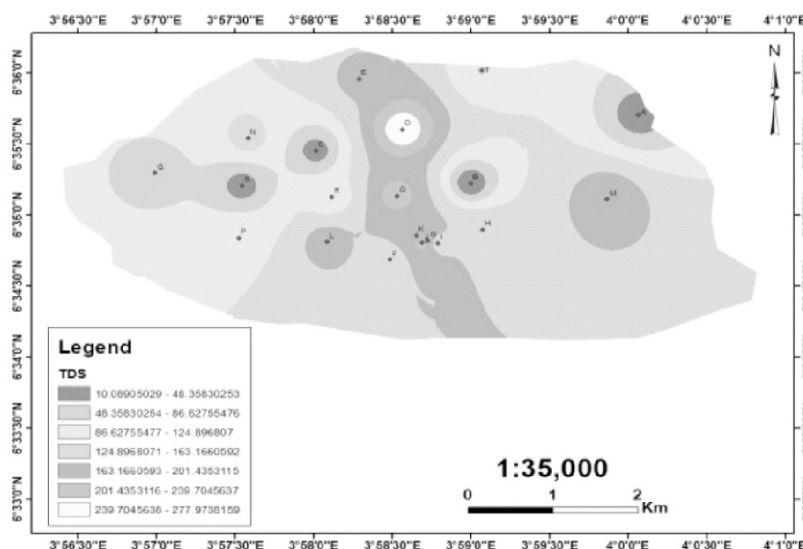
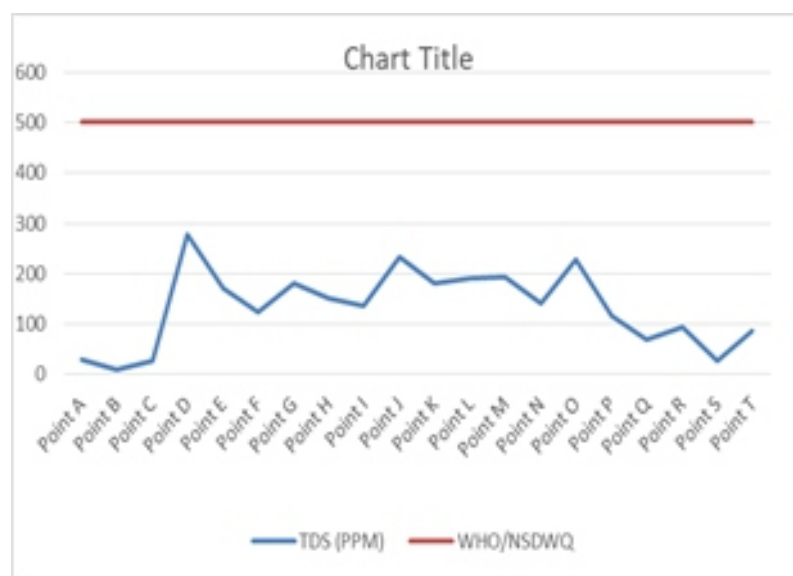
<b>Point T</b>	86	2.5	0.11	7.9	36	14.154	0.9
<b>Mean</b>	133.40	1.74	0.29	7.79	56.30	22.17	1.61
<b>SD</b>	75.80	0.65	0.51	3.60	31.08	12.25	0.52
<b>Min</b>	10.00	0.50	0.01	3.40	8.00	3.15	0.70
<b>Max</b>	278.00	2.80	2.40	19.70	103.00	40.50	2.50
<b>C V</b>	56.82	37.41	175.66	46.16	55.21	55.23	32.24
<b>WHO/ NSDWQ</b>	500	6.5 - 8.5	NS	NS	200	250	5

Source: Authors' Fieldwork, 2023

NS- Not specify, WHO: World Health Organisation

NSDWQ: Nigerian Standard for Drinking Water Quality

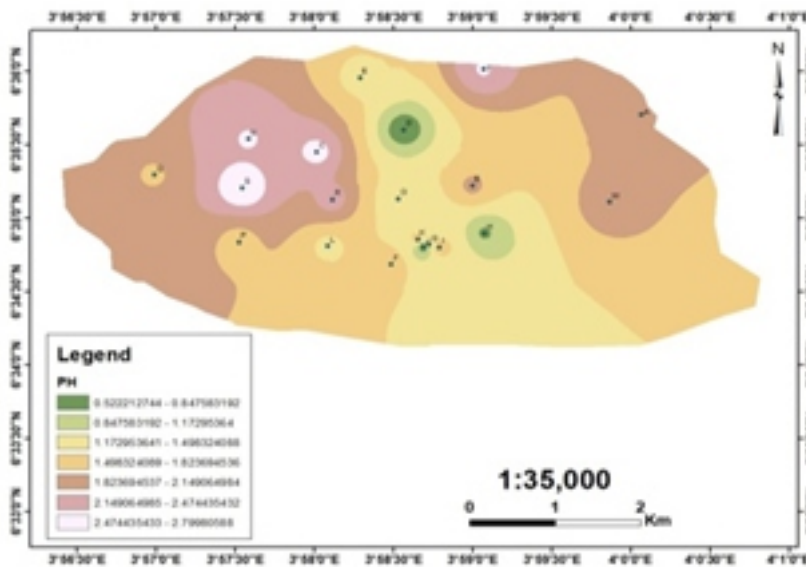
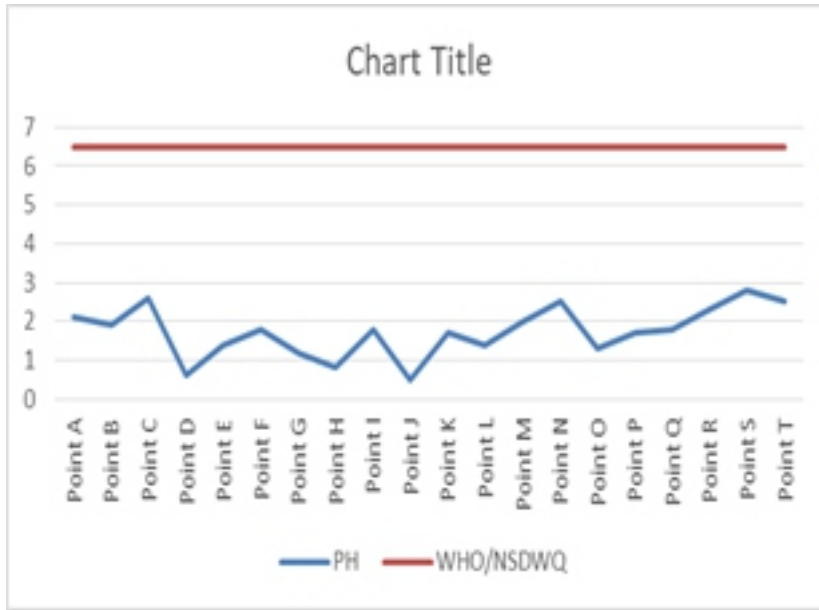
### Spatial Variation of Total Dissolved Solid



Figures 2 & 3: Chart and map showing TDS distribution in the study

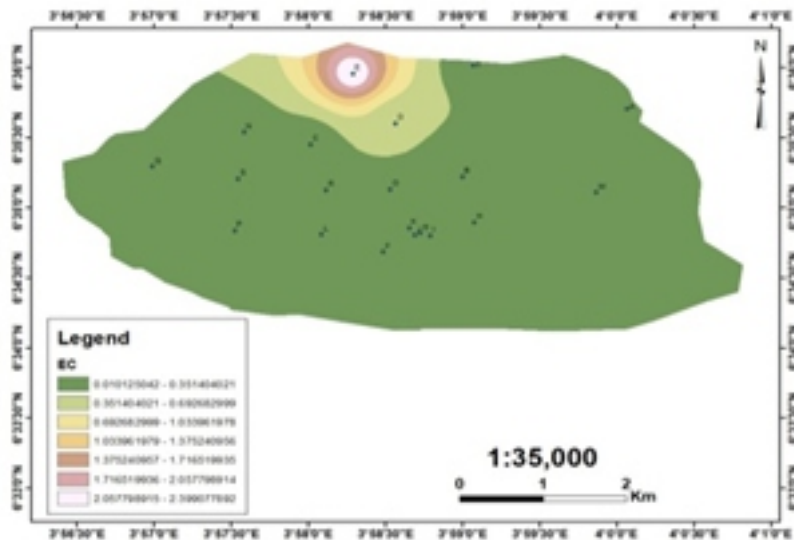
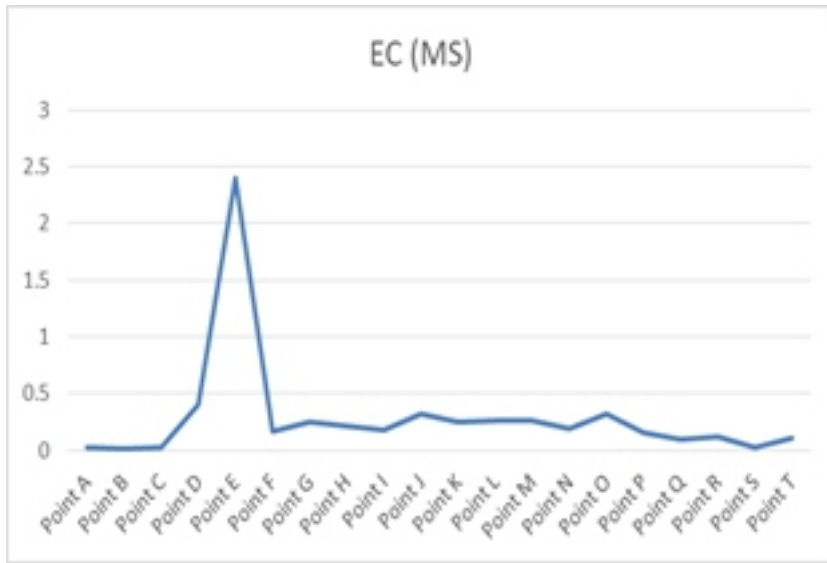
Source: Authors (2023)

### Spatial Variation of pH



Figures 4 & 5: Chart and map showing pH distribution in the study area  
Source: Authors (2023)

### Spatial Variation of Electrical Conductivity (EC)



Figures 6 & 7: Chart and map showing E C distribution in the study area  
 Source: Authors (2023)

The groundwater samples exhibit a wide range of electrical conductivity (EC) values, averaging at 0.29 with a deviation of 0.51. The EC's coefficient of variation (CV) is notably high at 175.66% (Table 1), indicating significant variability. Although no specific WHO or NSDWQ guidelines pertain to EC in drinking water, monitoring it remains vital for water quality assessment and contaminant detection. Elevated EC may suggest dissolved substances or pollutants.

Electrical conductivity (EC) gauges water or soil's electrical current conductivity. Elevated EC in water can signify dissolved salts, heavy metals, or contaminants with potential health implications. For instance, near coal-

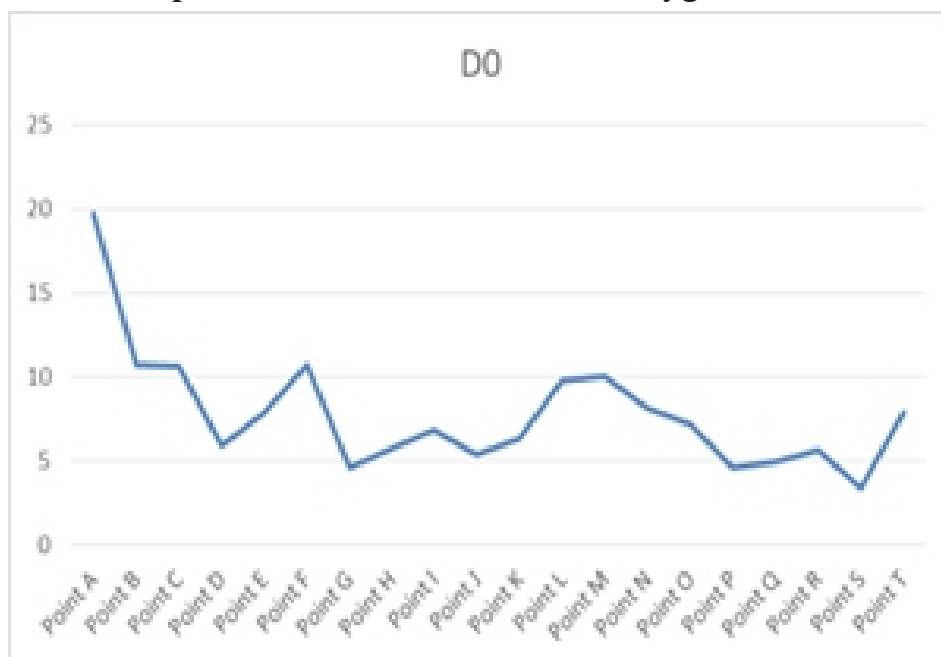
fired power plants, heightened soil EC links to potentially toxic elements (PTEs), posing human health risks (Achterberg et al., 2019). Concerns also extend to the potential health effects of electromagnetic fields (EMF) linked to EC. Though not conclusive, certain studies suggest EMF exposure from sources like power plants might lead to health issues like sleep disturbances (Liu et al., 2014). Furthermore, elevated EC in surface water is associated with heightened heavy metal and contaminant levels, impacting human health (Adesakin et al., 2020). These findings emphasise the relevance of SDGs 3 and 6, urging actions to ensure good health, well-being, and clean water while considering potential risks from environmental factors.

The analysis of dissolved oxygen (DO) concentrations in groundwater samples revealed a significant range, with values ranging from 3.4 mg/L to 19.7 mg/L and a mean concentration of 7.9 mg/L. The coefficient of variation, which exceeds 33%, indicates notable variation in the measured DO levels (Table 1). Specific groundwater samples from Points G, Q, P, and S displayed lower DO levels of 4.6 mg/L, 4.9 mg/L, 4.6 mg/L, and 3.4 mg/L, respectively (Fig. 8). These values suggest relatively low levels of dissolved oxygen in the groundwater samples. While WHO and NSDWQ do not specify permissible levels for dissolved oxygen in drinking water, extremely low DO concentrations below 2 mg/L are described as hypoxic, and the absence of measurable oxygen indicates an anoxic system (Diaz, 2015; Sakizadeh et al., 2019).

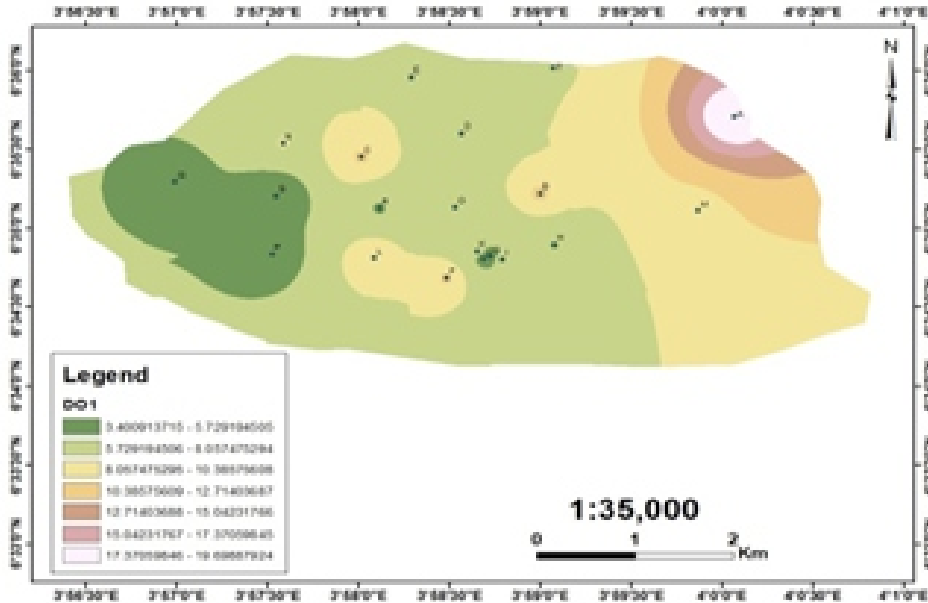
However, it is worth noting that high DO levels can accelerate corrosion in water pipes (Jung et al., 2009). Although dissolved oxygen does not directly impact human health, it can contribute to the corrosion of metallic products used for drinking, eating, and cooking. Drinking corrosive water can result in stomach and intestinal distress such as nausea, vomiting, diarrhoea, and stomach cramps. Prolonged exposure to corrosive water may cause severe damage to the brain, kidneys, nervous system, and red blood cells (Chen *et al.*, 2022).

Considering the potential health risks and infrastructure damage associated with high dissolved oxygen levels, appropriate measures should be taken to mitigate corrosion and ensure the provision of safe and non-corrosive drinking water.

### Spatial Variation of Dissolved Oxygen



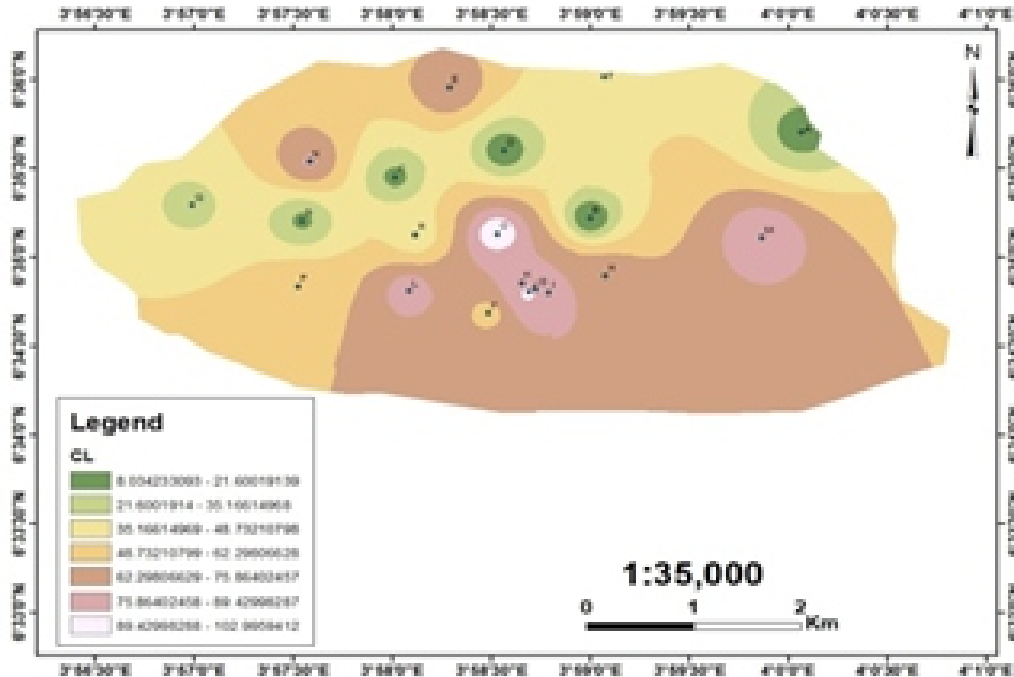




Figures 8 & 9: Chart and map showing Dissolved Oxygen distribution in the study area  
Source: Authors (2023)

### Spatial Variation of Chloride



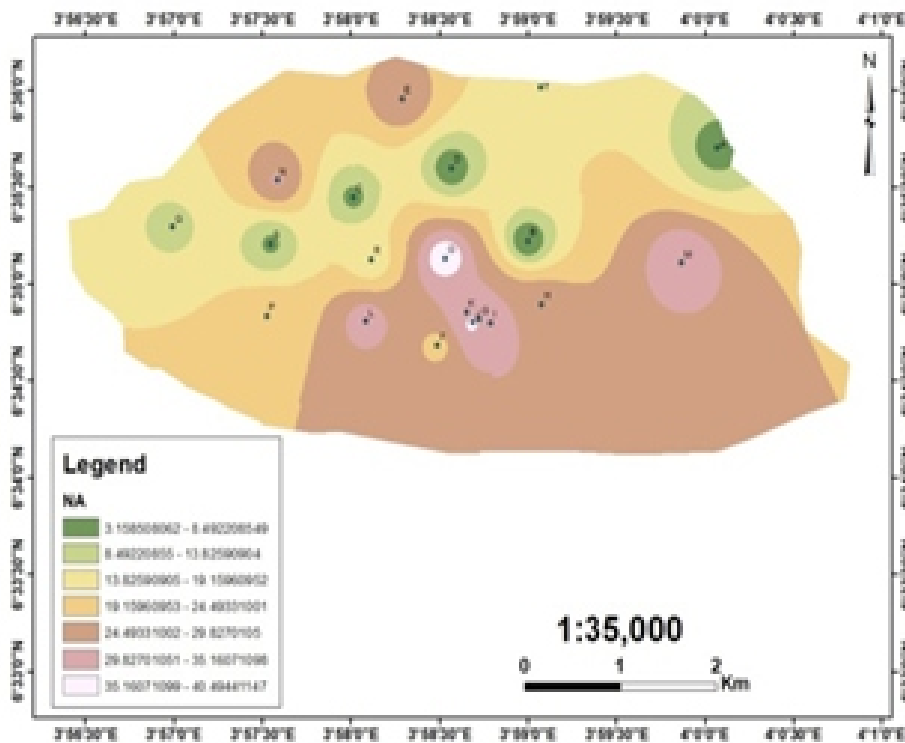
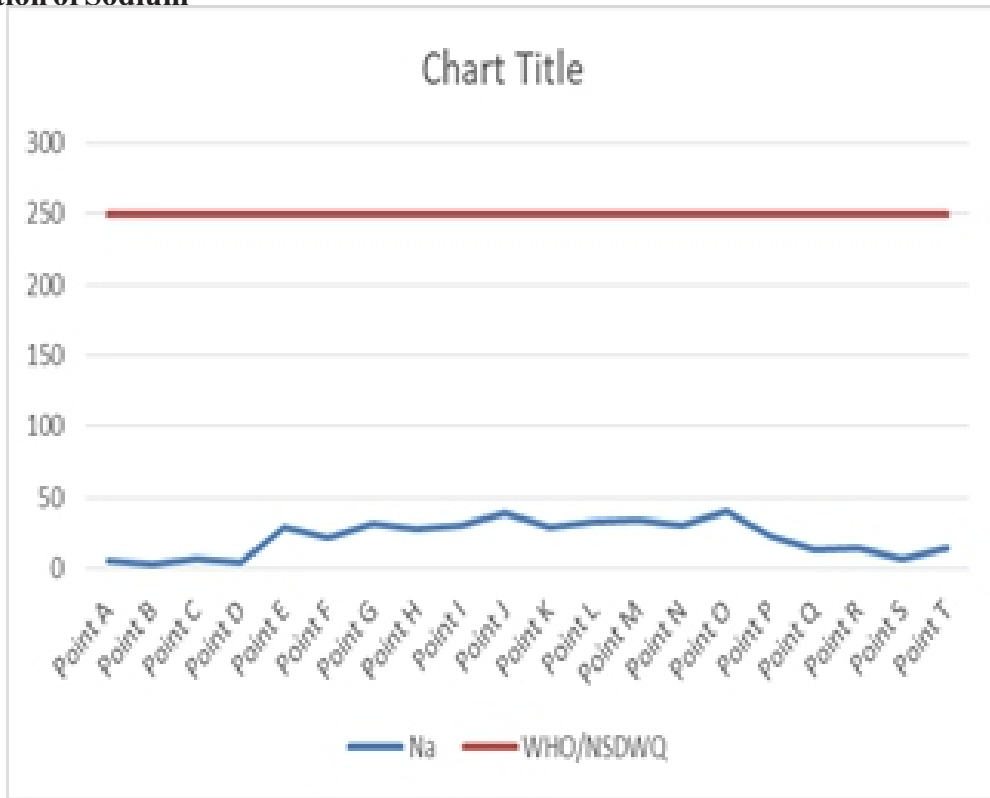


Figures 10 & 11: Chart and map showing Chloride distribution in the study area  
Source: Authors (2023)

The concentration of chloride ( $\text{Cl}^-$ ) in groundwater serves as an indicator of various sources of pollution, including sewage, saline water intrusion, domestic effluents, septic tanks, and high rainfall. Factors such as soil porosity and permeability also influence the build-up of chloride concentration (Fawell, 1993; Heydari and Bidgoli, 2012). The coefficient of variation for chloride ( $\text{Cl}^-$ ) is 55.21, indicating a significant variation in its concentration within the study area. Most of the water samples analyzed had chloride levels below the permissible limit of 250 mg/L set by WHO and NSDWQ (Fig. 10). The recorded chloride concentrations in all sampling sites ranged from 8 mg/L to 103 mg/L (Table 4.3).

It is important to note that chloride contributes to water's corrosivity effect and can affect the taste of water, giving it a salty flavour. In contrast, good-quality water should be tasteless (Fawell, 1993; Heydari and Bidgoli, 2012). Elevated levels of chloride in the bloodstream can lead to hyperchloremia, a condition characterized by an excessive chloride concentration (Duan et al., 2024; Obaido et al., 2024; WHO, 2003). Considering the corrosive nature of high chloride levels and the impact on water taste and human health, it is crucial to monitor and manage chloride concentrations to ensure the provision of safe and palatable drinking water.

Spatial Variation of Sodium



Figures 12 & 13: Chart and map showing Sodium distribution in the study area  
Source: Author (2023)

The coefficient of variation of sodium ( $\text{Na}^+$ ) is 55.23, which is an indication that there is significant variation in the concentration of  $\text{Na}^+$  in the study area. Sodium ( $\text{Na}^+$ ) concentration in the groundwater samples ranges from 3.1mg/l to 40.5mg/l with a mean concentration in water of 22.17mg/l.  $\text{Na}^+$  concentration in all the samples was found below the specified WHO and NSDQW standards for drinking water quality (Fig. 12).

Consuming high amounts of sodium has been linked to increased blood pressure, which can increase the risk of conditions such as stroke, heart disease, and heart failure. Other health consequences of excess sodium intake include arteriosclerosis, oedema (fluid retention), hyperosmolarity (imbalance of body fluids), convulsions, and an increased risk of infection (Biglari *et al.*, 2016)

On the other hand, sodium shortages can lead to various health issues as well. Insufficient sodium intake may result in dehydration, convulsions, muscle paralysis, decreased growth, and a general sense of numbness. It's important to note that the effects of excess sodium on infants differ from those in adults due to the immaturity of infant kidneys. Infants who experience severe gastrointestinal infections may suffer from fluid loss, leading to dehydration and elevated sodium levels in the bloodstream (hypernatremia) (Heydari and Bidgoli, 2012; USGS, 2013). Considering the potential health risks associated with both excessive and inadequate sodium levels, it is crucial to ensure the appropriate balance of sodium intake in drinking water to promote overall well-being and prevent adverse health outcomes.

The analysis of turbidity in the groundwater samples yielded insightful results. The average turbidity recorded was 1.61, with a standard deviation of 0.52. The range of turbidity values varied from a minimum of 0.70 to a maximum of 2.50. Calculating the coefficient of variation (CV), we obtained a value of 32.24%, indicating a significant degree of variability in turbidity levels within the dataset. Although WHO and NSDQW do not provide specific guidelines for turbidity in drinking water, it is generally recommended to maintain low turbidity levels to ensure visually clear and particle-free water.

The observed turbidity levels in the groundwater samples indicate that they are relatively low and fall within acceptable limits for drinking water quality. However, continuous monitoring of turbidity is essential to ensure on-going water clarity and prevent potential issues associated with sedimentation and the presence of suspended particles. Turbidity in drinking water can have several health implications. High turbidity levels can hinder the effectiveness of chlorine disinfection by shielding bacteria and other organisms. Certain organisms found in highly turbid water can induce symptoms such as nausea, cramps, and headaches. Additionally, an increased turbidity level in drinking water raises the risk of gastrointestinal diseases. This poses a particular concern for immunocompromised individuals, as contaminants like viruses and bacteria can attach to suspended solids, leading to adverse health effects. While turbidity itself does not directly pose a hazard to human health, it serves as an indicator of poor water quality and can mask the presence of parasites like *Cryptosporidium* (Stevenson and Bravo, 2019).

Numerous studies have shown that the consumption of highly turbid water can result in acute gastrointestinal illness (AGI). Turbidity can also create a protective barrier for microbacteria during disinfection processes, and high turbidity levels may contribute to the regrowth of pathogens within distribution systems, potentially causing waterborne disease outbreaks. It is important to note that while turbidity is linked to adverse health outcomes, studies often measure exposure at the population level, which can introduce bias due to the ecological

"fallacy" (De Roos *et al.*, 2017; Hsieh, 2015). The analysis of turbidity levels in the groundwater samples underscores the importance of maintaining low turbidity to ensure water quality and prevent potential health risks. Continued monitoring and assessment of turbidity are crucial for ensuring the clarity and safety of drinking water sources.

### Spatial Variation of Turbidity

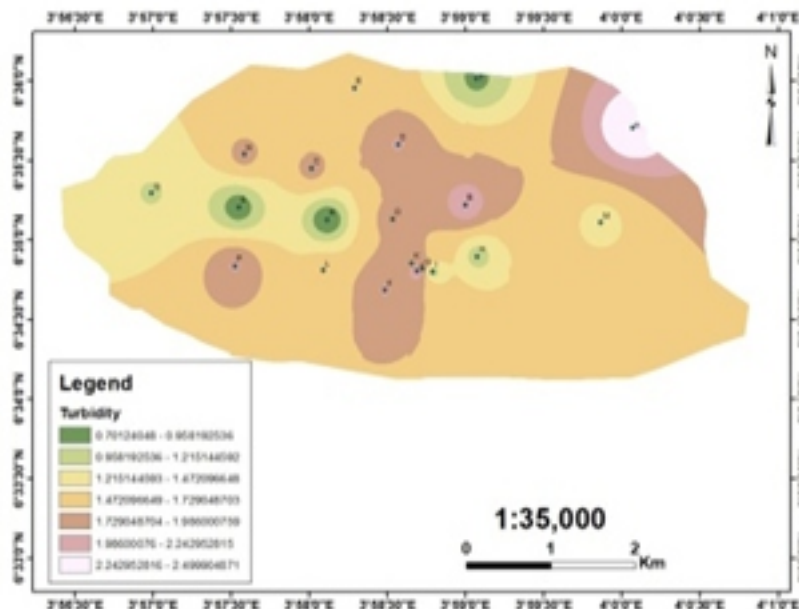
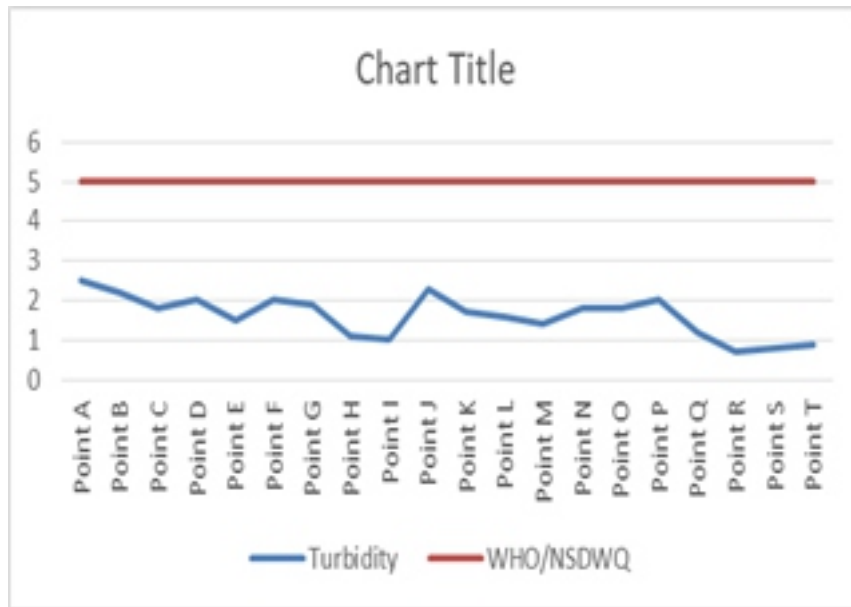


Figure 14 & 15: Chart and map showing Turbidity distribution in the study area  
Source: Author (2023)

## Implication and conclusion

The analysis of physicochemical parameters in the study area's underground water provides crucial insights into its quality. This examination revealed both the general freshness of the water and potential risks associated with elevated total dissolved solids (TDS) and dissolved oxygen (DO) levels. It is imperative to emphasize the significance of monitoring these parameters, as demonstrated by studies using IoT technology and low-cost, portable methods by Abdulwahid (2020), Moparthi (2018), and Tuna (2013).

Neglecting water quality monitoring, especially in developing countries and during natural disasters (Jain, 2013), poses significant risks, including the spread of waterborne diseases and adverse effects on agriculture, public health, and the ecosystem (Abbaspour, 2011). Considering these findings, aligning with SDG 6 on clean water and sanitation is crucial, emphasising the importance of accessible and safe water sources. Risks of groundwater contamination from untreated household wastewater necessitate regular septic system inspections, supporting SDG 3 (Good Health and Well-being) through universal access to safe drinking water.

The presence of high sodium levels, particularly for infants, underscores the interconnectedness of water quality with public health. Sustainable water sources demand a comprehensive approach involving monitoring, legislation, and consumer awareness. Challenges persist globally, as evidenced by the need for standardized approaches to managing public drinking water systems in developed countries. This calls for infrastructure investments, educational initiatives, and promoting women's access to formal jobs (Antunes & Martins, 2020).

Ensuring water quality aligns with health standards is crucial, with a focus on ongoing research and technological development to address pollution, especially in groundwater. The World Health Organization's Guidelines for Drinking Water Quality play a pivotal role, but challenges persist, as seen in Beirut, Lebanon (Korfali, 2009; Howard, 2003). In this context, SDG 7 (Affordable and Clean Energy) gains relevance, urging consideration of sustainable energy solutions for water purification (Li *et al.*, 2022).

Supporting household water treatment, secure storage initiatives, and advocating for safe rainwater harvesting is imperative for enhancing drinking water quality and reducing waterborne diseases. These measures need implementation in communities, schools, and healthcare facilities to achieve a comprehensive and effective approach to water quality management.

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## 7. Can Grandparenting Be a Resource for The Developing Child In Nigeria?

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### Abstract

Normally, a child is better raised by informed and responsive natural parents. However, due to circumstances such as insecurity, communal strife, premature death, violence, displacement and even distance between home and workplace; the proportion of children being raised solely by grandparents in West African countries is increasing, with Nigeria in the lead. The objective of this research was to assess the quality of care received by such children. The research question was, do grandparents provide adequate and effective care within the five prescribed WHO/UNICEF Early Childhood Care and Developing (ECD) Nurturing Care Framework of Good Health; Adequate Nutrition; Responsive Caregiving; Safety and Security; and Early Learning Opportunities? To answer this, 100 grandparents, with live-in grandchildren, in Lagos and Ogun States were interviewed using two standardized instruments. One gauged the knowledge, attitudes, and practices (KAP) of the participants on the five nurturing pillars while the other elicited qualitative responses about them. Results showed that grandparents had good understanding and practices of what constitutes 'Good Health' in nurturing children. However, there were wide gaps in 5 out of each of the 7 items that constituted "Adequate Nutrition" and "Opportunities for Early Learning". For the pillars of "Responsive Care-giving" and "Safety and Security," 4 of each of the 7 items had gaping holes. The study pointed out the domains wherein training and other intervention programs should be focused if grandparents are to become an effective force for achieving SDG goals 3 and 4 concerning child development.

**Keywords:** Grandparenting, Early childhood development, ECD nurturing care framework, SDG

## Introduction

The type and quality of care received by young children is critical to their survival, growth, and development. This explains why there is so much interest in the role a caregiver plays in the life of a child. Caregiving starts from birth and typically precedes the period of non-formal or formal schooling for any child. In a typical African context, the parent is the primary caregiver entrusted with the responsibility to provide physical, nutritional, health care and nurturance to facilitate the development and induction of the child into a social and cultural life. (Akinware and Oguntuashe,2023) However, a variety of situations can lead grandparents into providing care and nurturance for the child. These include absence of biological parents due to such reasons as going abroad to study teenage pregnancy and after delivery, young mother going back to school; parental divorce where neither parent is able or willing to shoulder responsibility or when children are orphaned. Another situation occurs when grandparents provide care on a temporary basis like both parents having to go to work at the same time or when the baby has just arrived, and the mother needs support. Yet another context is when multiple generations (great-grandparents, grandparents, parents, and children) occupy different "quarters" in a household as often happens in traditional African villages. Each arrangement has its own characteristics, strengths and weaknesses and impacts development in the child differently. However, regardless of the type of living arrangement, Gottlieb (2018) provides an excellent and detailed panoramic perspective of the role of grandmothers in providing care of infants among the Beng people of Cote d'Ivoire. The panorama captures advice and counsel stretching from pre-natal care, birth, ante-

natal, naming ceremonies, dealing with illnesses and diseases and so on. This characterization seems typically African and therefore worthy of being quoted in some detail at least with respect to one aspect of infant care that is universal, that is, breastfeeding;

*“Soon after birth, if the breast water that will sustain your baby over the next year hasn't yet poured out, ask female elders of your village for leaves to lay on your breasts to make the water come in.*

*If your breasts are also swollen, witchcraft is the cause. Some healers know other leaves you can heat and apply to your breasts, to reduce the swelling. Meanwhile, start doing Kami right away. When the baby cries, before offering your breast, get a cupful of cool water from your large ceramic water jar. Cradle the baby in your arms, tilt the head back a little, and give a small palmful of the water. If your little one refuses the water, go ahead and force it down the throat.*

*You must teach your baby to like the taste of water. That way, when you can't be together- say, you're chopping trees for firewood or collecting water from the well- someone else can satisfy your hungry child with plain water until you return breastwater. You know how much work we women have to do, and we can't always take our babies along. If you don't train your baby to do kami, your life will be difficult!” (p.168)*

From medical, nutritional, and psychological points of view, there is a lot that needs to be distilled in the quote above. First, there is the recognition by Beng people that breastmilk is sufficient to sustain life and provide the nutrients needed for the first year of infancy. This is in accord with the modern notion and recommended practice of exclusive breast feeding for the first year of life. However, Beng, and for that matter, African societies will introduce water to the infant. The reasons vary. Among Beng, it is to enable the child to survive and thrive in the hands of surrogate mothers while real mother is at work and so breast milk is unavailable. So, in a sense, Beng society appears to be doing the wrong things for the right reasons. In some other societies, water is a supplement as breast milk alone is not adequate. The point, in any case, is this, do grandparents possess the required level of knowledge, capacity and attitude to provide adequate care for the child?

Hence, our interest in this research centers not on grandmothers' advice but more on grandparents providing primary care for their grandchildren. This is called grand families in the literature. Aransiola *et al* (2017) sampled 20, 841 grand families in four West African countries using the National Demographic and Statistical Surveys (NDHS,2013). Nigeria had the highest number standing at 7,317 (35.1%). Another interesting finding is that across the four countries the number of pre-school children living in grand family situations was highest compared with primary and secondary school pupils amounting to 51.3, 75.8, 51.5, and 56.6 for Ghana, Liberia, Nigeria, and Sierra-Leone respectively. They characterized the families in terms of health and hygiene status, explored and found a high correlation between grandparenting and prevalence of preventable diseases like malaria, diarrhoea, and cholera. Now, the WHO/UNICEF, Early Child Care (ECD) Nurturing Care Framework (2018) is conceived as the sine qua non that caregivers must have to be able to respond adequately to the needs of the developing child so they can survive, thrive and transform in all circumstances. It has five, inter-related and indivisible components or pillars including Good Health. It was thought that this offered a sufficient justification to evaluate the extent to which grandfamilies promoted or hindered the other four pillars namely, Adequate Nutrition, Responsive Caregiving, Safety and Security, and Opportunities for Early Learning. The other justification for this study was that given the impact of Covid-19 pandemic, unimaginable increase in the

frequency and intensity of violence, insurgency, kidnapping, banditry, crime and terrorism, the proportion and quality of grandparenting in Nigeria would be negatively impacted.

The objectives of the study were to:

1. Characterize the demographic features of grandparents in some parts of Lagos and Ogun States of Nigeria.
2. Evaluate grandparents' knowledge, attitudes, and practices (KAP) about the UNICEF Nurturing Framework.
3. Establish gaps in the knowledge, attitudes, and practices of grandparents about the nurturing framework.
4. Make recommendations on Policy shifts, intervention strategies, training and training-materials that are capable of closing observed gaps.
5. Enable the attainment of Sustainable Development Goals (SDG) 3 and 4 which are to; *“Ensure healthy lives and promote well-being for all at all ages”* and *“ensure inclusive and quality education for all and promote lifelong learning”*

## Methods

### Participants

The participants comprised 100 grandfamilies purposively selected after preliminary scouting by five trained research assistants who lived in the same neighborhoods as them. Each family met the major requirement of grandchildren living with grandparents who could be grandmother, or grandfather or both. The locations of the participants were in Oworonshoki, Oshodi, and Igando areas of Lagos State while others resided in Agbado in Ojokoro Area of Ogun State all in Nigeria. Because research assistants and participants knew each other, rapport was quickly established, confidentiality was assured, and information provided by participants was recorded on audiotape as well as on interview-guiding questionnaires. Where the participant chose to complete the questionnaire themselves, they were allowed to. Each one of the five research assistants sampled 20 grandfamilies in their location.

### Materials

The trained research assistants administered two instruments. One was entitled “Nurturing Care and Early Childhood Development” (NCECD) and the other was labelled “Interview Schedule on Nurturing Child Care, Survival and Development.” NCECD: This had two sections A and B. Section A elicited demographic information such as gender, age, educational attainment, occupation, ethnicity, state of origin, community, and nature of family (two-grandparent or lone). Section B comprised 35 statements designed to elicit information about participants' knowledge, feelings and practices about the five pillars of the Nurturing Care Framework, that is, Good Health, Adequate Nutrition, Responsive Caregiving, Safety and Security, and Opportunities for Early Learning. Each pillar had seven statements carefully designed to reflect dimensions of its core meaning. Four University educated professionals in Education and Social Sciences were used as judges to validate each one of a set of large statements. Eight out of the 35 statements had an inter-rater validity of 100% while 27 had an inter-rater agreement of 75%. Each statement had a 5-point rating scale ranging from Strongly Agree (SA); Agree (A);

Don't Know (DK); Disagree (D) to Strongly Disagree (SD). Strongly agree carried a numerical value of 5 while strongly disagree was assigned a value of 1 except in the case of 9 statements which were scored in reverse order. The 35 statements were randomized to prevent place-response. An example of a statement on Nutrition is "Inadequate feeding in early childhood negatively affects child's performance in schoolwork" Strongly agree response on this carried a score of 5. On the contrary, "Endeavoring to answer children's questions even when it is not convenient teaches them to be forward" was scored in reverse such that strongly agree response was scored 1. "To be forward" is an expression in Nigerian English indicating assertiveness.

The Interview schedule instrument consisted of five "open-ended" questions designed to elicit qualitative responses from the participants such that they could express themselves and perhaps offer information relevant to the theme of the research but not anticipated in the "closed response" format of the quantitative instrument. Each question represented one of the nurturing framework pillars. The five questions were drawn from a set of questions after the four principal researchers had debated among themselves which statement was most fertile and closest to the heart of the pillar. For example, "how can grandparents provide opportunities for their grandchildren to learn when they are at home and not in school?"

## **Results: A**

### **Demographic profile of participants.**

The largest number of participants (42) were aged between 50 and 59 years, followed by those aged 60 years and above (27) then 40-49 years, numbering 16, and the last age bracket of 30-39 years stood at 15. This means that before the age of 49 years, 31% of our participants had become grandparents. 82% of our sample was female while the males were 18%. Not surprisingly, the Yoruba ethnic group numbered 44%, Igbo 22%, and Hausa 6% while other

ethnic groups were represented by 28%. In terms of educational attainment, 60% did not have College education. That is had a Senior Secondary School Certificate as their highest educational achievement. Only 40% had OND/NCE and above qualifications. The living arrangements is quite revealing in that 50% lived in Flats while another 50% lived in one or two-room structures, suggesting that 50% of our participants are lower middle class. This is supported by the nature of their occupation/employment whereby 74% were traders, 9% were civil servants, 8% were teachers and unemployed/retirees were 9%. Interestingly, the gender of the grandchildren in grand-family situations is almost equal

with Males standing at 49% and females, at 51%. 37% of the parents of the children visit regularly, 36 sometimes but 27% never visit. For the duration of time spent with grandparents, 40% were over 6 years, 18% had grandchildren between 3 and 5 years, 31% between 1 and 3 years while only 10 had been living with their grandparents for less than a year.

### **Good Health:**

Analysis of data on grandparents' perceptions of good health indicates that only two out of the seven items on Go revealed gaps, albeit insignificant, standing at 10 and 14 for statements on the spread of diseases and allowing health workers into homes on immunization days. The spate of insecurity in the country may explain the reluctance to allow health workers into people's homes. The grandparents' comparatively good performance on

Good Health is perhaps due to the heavy dose of health information promoted by COVID-19 pandemic campaigns globally. This contrasts sharply with the findings of Aransiola *et al* (2017) on grandparents' knowledge of preventive childhood illnesses (Table 1).

**Table 1: Grandparents' Perceptions on Good Health**

S/N	Good Health	SA %	A %	DK %	D %	SD %	% Ideal Score	% Actual Score	% Gap
1	Good health is sum total mental, physical, & Spiritual wellbeing of a person.	72	24	1	1	2	100	96	4
2	Taking a sick child to hospital for Treatment is necessary for child survival	60	36	1	2	1	100	96	4
3	Vaccines help to protect children Against diseases that can cause illness.	68	29	2	1	0	100	97	3
4	Diseases are caused by germs that Attack children and can spread from Person to person.	45	45	2	4	4	100	90	10
5	You should allow health workers into your home to immunize children on Immunization days.	45	41	4	6	4	100	86	14
6	Encouraging child to sleep always Under an insecticide treated net Reduces malaria sickness.	67	27	4	2	0	100	94	6
7	Regular handwashing is a good health Practice that prevents illnesses and diseases	72	25	1	2	0	100	97	3
	Total	429	227	15	18	11	700	656	44

### Adequate Nutrition:

The gaps in grandparents' perceptions of adequate nutrition are worrisome, both in terms of number and size. Only two out of the seven statements under "adequate nutrition" have insignificant gaps: these two deal with the importance of protein, vegetables, and food supplements. The other five, ranging from exclusive breast-feeding through iodised salt to the effect of inadequate feeding on school performance have huge gaps (Table 2).



**Table 2: Grandparents' Perceptions of Adequate Nutrition**

S/N	Adequate Nutrition	SA %	A %	DK %	D %	SD %	% Ideal Score	% Actual Score	% Gap
1	Salt containing iodine should be Used to prepare children's Foods.	27	46	12	8	7	100	73	27
2	Children should be fed more Meat, fish, and eggs than adults.	61	31	1	6	1	100	92	8
3	Inadequate feeding in early Childhood negatively affects Performance in schoolwork.	33	43	9	11	4	100	76	24
4	Inadequate feeding affects Health later in life.	31	43	6	10	10	100	74	26
5	Between birth and six months, Children do not need additional Food or fluid because Breastmilk contains food and water.	46	33	1	16	4	100	79	21
6	Culturally accepted food taboos Should be adopted in the Community for all children.	23	22	19	21	15	100	45	55
7	Children need to eat vegetables, Beans, crayfish, cod liver, and Take other food supplements.	66	29	3	2	0	100	95	5
	Total	287	247	51	74	41	700	534	166

**Responsive caregiving:**

The gaps in grandparents' perceptions of the seven statements describing responsive caregiving are even more worrisome than those observed on adequate nutrition. This is especially so considering the magnitude of gaps in allowing the child the freedom to feed self, to choose to play alone, or knowing the appropriate age to warn children about strangers (Table 3).

**Table 3: Grandparents' Perceptions of Responsive Caregiving**

S/N	Responsive Caregiving	SA %	A%	DK%	D%	SD%	% Ideal Score	% Actual Score	% Gap
1	Allowing a child to feed self, dress self, and use simple household utensils spoils the child	15	14	2	36	33	100	69	31
2	Speaking English and indigenous languages like Yoruba, Igbo, Hausa to children enables them to see that one object can have two names.	55	44	1	0	0	100	99	1
3	Encouraging children to share what they have or what they have done promotes friendship.	53	39	3	3	2	100	92	8
4	Telling the child that playing in the rain or sun is not safe will make them timid.	12	36	9	19	24	100	43	57
5	Discussing how a child can refuse baits such as food, money, snacks from strangers can only be done when child is about 8 years old.	8	11	5	20	56	100	76	24
6	A child should be allowed to play alone when other children are around.	4	31	1	32	32	100	35	65
7	Allowing an older child to take care of younger ones is to be encouraged.	39	44	5	10	2	100	83	17
	Total	186	219	26	120	149	700	497	203

**Safety and Security:**

The gaps observed on safety and security issues appear progressively worse with items like impacts of discussing emergencies with children and force-feeding a child who is sick being misunderstood by 60% and 67% of participants respectively. These and other misunderstood safety and security issues such as letting children know what to do in cases of home accidents (Table 4).

**Table 4: Grandparents' Perceptions of Safety and Security**

S/N	Safety & Security	SA %	A %	DK %	D %	SD %	% Ideal Score	% Actual Score	% Gap
1	Discussing emergency situations such as fire outbreaks, robberies with children create fear in them.	18	36	6	22	18	100	40	60
2	Discussing what children should do in case of home accidents mean you have no faith that God will protect them.	7	13	3	31	46	100	77	23
3	Drug abuse is the intake of drugs not prescribed by a doctor.	41	37	5	14	3	100	78	22
4	A child who is sick and does not eat can be force fed.	26	32	9	22	11	100	33	67
5	Children should be taught not to follow strangers at all.	76	18	3	1	2	100	94	6
6	Sharp objects such as knives and nails should be kept away from children as much as possible.	73	24	0	2	1	100	97	3
7	Securing the home environment for the child is tedious but important.	43	48	4	4	1	100	91	9
	Total	284	208	30	96	82	700	510	190

**Opportunities for early learning:**

The participants, made up of 100 grandparents, also fell short of expectations on statements designed to elicit their understanding on opportunities for early learning. A look at Table 5 below shows that only the item on the relationship between children's songs involving numbers on counting is gapless. The other six items have huge gaps ranging from 36% to 48%.

**Table 5: Grandparents' Perceptions of Opportunities for Early Learning**

S/N	Opportunities For Early Learning	SA %	A %	DK %	D %	SD %	% Ideal Score	% Actual Score	% Gap
1	Allowing child play with crayons, paints, and clay makes the house dirty and has no bearing with school work later.	13	31	4	32	20	100	52	48
2	Letting child help with house chores like putting water in kettle teaches math.	30	34	9	15	12	100	64	36
3	Teaching children , songs that involve numbers helps them with counting.	65	32	0	1	2	100	97	3
4	Always trying to answer Children's questions, even when it is not convenient teaches them to be too 'forward'.	7	34	6	29	24	100	53	47
5	Telling or reading stories that promote cooperation to children will discourage competition in school.	19	28	6	31	16	100	47	53
6	Letting the child tell you what they have done in the day, step by step, is good for orderliness.	46	42	6	2	4	100	88	12
7	Adults should use adult words and sentences when talking with children.	27	25	7	24	17	100	52	48
	Total	207	226	38	134	95	700	453	247

**Summary of results on nurturing care pillars:**

Below in Table 6 is a summary of the gaps observed by the research on the five WHO/UNICEF nurturing care pillars and the major contributors to them. From the table, the magnitude of the gaps can be ranked thus: opportunities for early learning' came first with a value of 247. This is followed by 'responsive caregiving' with a gap size of 203. 'Safety and security' were third, at 190 while 'adequate nutrition' took fourth position with 166. The smallest gap came from 'good health' at 44. The implication of this is that the needs of children who were raised primarily by their grandparents suffered neglect. The degree of neglect would be determined by the gaps described above, meaning that only in health would their development stand some chance of receiving the required support needed.

**TABLE 6: Summary of Nurturing Care Pillars & their Gaps**

Nurturing Care Pillars	Ideal score	Actual score	Gap	Major contributors to gaps
Good Health	700	656	44	Apprehension over home visit For immunization.
Adequate Nutrition	700	534	166	Iodised salt; nutrition & later School work; food taboos
Responsive Caregiving	700	497	203	Autonomy over self, action. Consequence of C's action. Age to promote critical think
Safety & Security	700	510	190	Outcome of emergency. Force feeding. Home accidents discussion.
Opportunities for Early Learning	700	453	247	Relations b/w play & school Home activity & schoolwork Outcome question-asking Cooperation/competition

**Results: B****Qualitative Data Analysis:**

Content analysis of the responses given to the five questions in the interview schedule was carried out. This decision followed a brain-storming session by the four principal investigators which resolved that it was the most appropriate analysis given the thematic nature of the data. At the session, the semantic field of each utterance/statement of the participants was explored with each researcher stating the meaning of a statement independently of others. Where consensus was not reached on any statement, it was discarded.

The first question, which was on 'good health' yielded responses which on analysis revealed as follows:

1. All the grandparent's thought immunization was good for the child.
2. They accurately listed benefits of immunization to include prevention of polio, reduction in risk of paralysis, measles, boosting child's immune system, prevention of cough, yellow fever, reduction in childhood sicknesses etc.

This shows that they had insight into issues about good health generally, and in particular, knew the benefits of immunization. This shows that the greater the insight shown on immunization issues, the smaller the gap observed in the pillar on 'good health' in the quantitative analysis.

To the second question on the causes of weight loss and what to do if their 3-year-old grandchild refuses to eat, their responses indicated that they had insight and knowledge into:

1. The causes of weight loss such as pre-existing medical issues, childhood trauma, worms infestation, malaria, playing with sand, dehydration, environmental conditions, constipation etc.
2. What to do if their 3-year-old did not eat. Their responses varied from making food attractive, deworming the child, giving multivitamins, force-feeding the child to seeing a pediatrician and praying to God.

This is in consonance with their accurate responses to the statements on protein, vegetables, and supplements in the 'adequate nutrition' pillar. The problem appears to be the inability of grandparents to relate adequate nutrition with later life schoolwork.

The third question which proved what grandparents could do to provide opportunities for early learning at home elicited responses which also varied with most of them appearing inappropriate. Examples of such are, letting the children stay in the shop so they can be bold to face customers, flogging them when they do something wrong, teaching them about Christ, farming, morals, and prayers, teaching them about house chores and so on. However, some responses appeared appropriate. Examples of these include teaching them songs and rhymes in the child's dialect, telling them realistic stories, and playing educational CDs, games, and toys. All of these corroborate the only statement with the smallest gap on the 'opportunities for early learning' pillar. This statement is on the effect of teaching children, songs that involve numbers on their ability to count.

The fourth question on how grandparents can always keep their grandchildren safe and secure elicited responses that were accurate, appropriate, and culturally relevant. For example:

1. teach them to be smart and wise,
2. tell them never to go out without telling an adult
3. staying away from cooking gas
4. teach them not to take bait from strangers etc.

This shows that grandparents are knowledgeable about what to do to keep children safe and secure. These preventive activities agree with three of the seven statements on the 'safety and security' pillar. These three are about practical things that keep children safe, like keeping sharp objects away and not following strangers. The statements that gave grandparents issues appeared to be those that required them to hold discussions with children on safety and security matters.

The fifth question asks, “would you agree that some of the existing child nurturing practices you were used to can be improved with a better understanding of ECD?”. Some said yes because: (i) technology brings new things, (ii) Children are hyper psychologically active so standard measures should be taken to care for them, and (iii) children are able to converse with adults more, unlike the olden times. Some said no because: (i) social media is evil for these children, (ii) children cannot be controlled, (iii) they lack manners and morals, and (iv) they talk back at adults; hence they can be rude.

## **Discussion**

Our discussion starts with the observation that motivated the research in the first place which was that grandparents were becoming more and more primary caregivers to their grandchildren. This trend is likely to

increase for a variety of reasons alluded to in the introduction. Hence, an evaluation of the skills possessed by grandparents in rearing children in the 21<sup>st</sup> century was done against the benchmark established by WHO/UNICEF. The results presented above show that the grandchildren in the care of grandparents, who were largely grandmothers, were not likely to receive the quality care they needed. An interesting finding concerning the age at which women became grandmothers may shed light on the handicap to provided quality care. Becoming grandmothers in their 30s means that they did not staying in school for too long and neither did the children they had when they were teenagers. This is important in view of the established correlations suggesting that the higher the educational attainments of parents, the higher the expectations they have about their children's scholastic performance. (Carnegie Corporation,1994; Ige, 2013) This provokes a pattern of behaviours such as seeking information about appropriate helping and supportive behaviors that parents can deploy to enable their children develop and achieve in school. This attitude appears lacking in some of our participants judging by their reluctance to improve their child-rearing knowledge and skills, claiming that social media is evil, and children of today are rude because they talk back. The relatively small gaps observed in the responses given to statements about health indicate that the grandparents were knowledgeable about children health issues, that they knew what to do to prevent and manage some childhood diseases. Health is wealth for most Nigerians and given the prevalence of illnesses and diseases which terminate life prematurely in tropical Africa, many people have become sensitized to health matters. This mental state got a boost from the global campaign to stem the tide of the Covid-19 pandemic. Nutrition matters, although highly related to health, suffered ignorance. Grandparents knew that proteinaceous foods and vitamins were necessary for the child but failed to link it to the health and school performance of the child later in life. This has implications for the implementation of the Integrated Early Childhood Development Policy (Federal Government of Nigeria, 2007). The pillar on responsive caregiving has the second largest gap. It is interesting to note that many of the statements that posed difficulties for the grandparents had to do with granting the child autonomy for self-expression through his/her actions like eating, dressing up and so on. Holding discussions with the child on what they can or cannot do appears to be a challenge for the grandmothers not only in this pillar but also in the security and safety pillar. They know what to do and what to avoid in keeping children safe and secure but do not seem to approve of holding discussion on them for fear perhaps that the children would thus be encouraged to talk back and become rude, challenging and uncontrollable. Given this, it then becomes imperative not only to include ECD matters into ante-natal programs but also to mount ECD sensitization programs for grandparents at marketplaces, worship centers and other community spaces. The pillar on opportunities for early learning has the biggest gaps which were because of failure to link play with the performance of the child in school later. Similarly, grandparents failed to link home activities with the child's schoolwork. Neither did they associate reading to the child with the child's school performance. Lastly, the importance of answering the questions raised by the child was lost on them. This is perhaps the most worrying as it has to do with the relationship between stimulation and optimal development in childhood. As worrying as it is, it is perhaps not surprising as Nigerian parents typically do not readily accept the linkage between play in infancy/early childhood and scholastic performance in school. Thus, their readiness to provide play opportunities, props, toys and other playthings or be involved in play activities with their children is reduced. Furthermore, the detachment of play and school performance makes them perceive play in preschool settings as a waste of time and resources. This in turn, forces them to pressure pre-school teachers and administrators into “formal teaching” of pre-school children (UNICEF, 2013).

Playing as a process which stimulates growth and development of domains such as physical, cognition, language, social, and emotional is lost on parents. That this is also true of grandparents is hardly surprising. Of concern also is the grandparents' detachment of the linkage between adequate nutrition and school performance. The relation between nutrition and bodily health was clear and understood but its link with perceptual, cognitive, and emotional performance later in school was lost on them.

The implications of these gaps for the effective implementation of the National Policy for Integrated Early Childhood Development in Nigeria (IECD) are indeed huge given the investments that parents, community, Governments and the Nation make on the child. The policy draws on empirical research evidence from health, nutrition, psycho-social care, and protection which are crucial to the development of intelligence, personality and social behavior. In doing this, it aims to integrate interventions from the afore-mentioned sectors, to develop programs which would be coordinated and effectively implemented to optimize the development of children aged 0-5years. The objectives of the IECD policy are many but were all derived from the National policies on Education, Health, Food and Nutrition and the Child Rights Act. They aim to provide are and support for the rights of the child to Good nutrition and health; Safe environment and protection from harm; Psycho-social stimulation and “*effect a smooth transition from the home to the school*” (Federal Government of Nigeria, 2007. p.3). As can be seen, these objectives are enshrined in the WHO/UNICEF Nurturing Care Framework. The concern here is that a child in the care of his/her grandparent is unlikely to make that crucial transition from home to school seamlessly if the primary caregiver does not link adequate nutrition with performance in school later in the life of the child.

Policy review: The discussion of the results of this research would be incomplete if attention is not drawn to the necessity to review the IECD policy urgently and effectively fund its implementation across the Nigerian society. This call is not new and has been made even by development partners like UNICEF (2013). To underscore the point, the policy was adopted in 2007 and it still has targets that are tied to MDGs 4 and 6! The review should accommodate research findings such as this by identifying grandparents as stakeholders in section 8.0 and spell out their roles and responsibilities as it did to individuals and institutions described as stakeholders. As a matter of fact, only in one place did the policy speak about grandmothers where it encouraged them to “*live in and share indigenous knowledge with child*” (p.17). Obviously, the policy did not consider nor envisage grandparents as primary providers of care to the child, but the reality as pointed out by this, and other research works is different (Oguntuashe, *et al*, 2023). After the review and update, it is recommended that the policy should be translated into indigenous languages, widely circulated and effectively implemented. The inclusion of a one-year pre-school

experience for the child under the Basic Education scheme is a laudable first step. Other relevant steps should include teacher/caregiver preparation, morale, prestige, facilities, and equipment. With this in place the risks of the child of being raised by well-meaning but ill-informed grandparents are likely to be attenuated at the pre-school.

### **Limitations**

One of the major limitations of this research is that the statements adjudged by the participants were hypothetical although they were designed to be close enough to reality. It is one of the perennial challenges that survey methods have. This limitation could have been removed if an ethological approach involving home visits was paid for by trained research



assistants armed with checklists containing behaviors patterns to be observed at regular intervals. The behaviour as they occur in-situ could also have been recorded and later transcribed and analyzed. The results of such an exercise would have helped to confirm or refute some of the results produced by the current survey.

## Conclusion

The involvement of grandparents in the upbringing of their grandchildren is real and the frequency of its occurrence is most likely to increase given the prevailing socio-economic, security and other existential circumstances in Nigeria. From the results of the research, grandparents are not equipped to efficiently accomplish the task of responding effectively to the needs of the children in their care. Therefore, it is recommended that the Integrated Early Childhood and Development Policy (IECD) be reviewed to include grandparents as stakeholders. With this recognition, steps should then be taken to mount training programs for them at the market, community, and worship centers. Hence, to answer the overall research question, “can grandparents become a resource for the developing child in Nigeria?”, the answer would be a qualified “yes”. To enable this, teams comprising ECD experts, psychologists, and nutritionists would engage grandparents with a view to closing the gaps identified by this research. By so doing, a strong foundation would have been laid for the attainment of SDG 3 and 4 which ensure healthy lives, well-being, inclusive education and promote lifelong learning for all starting from the most vulnerable, infants and children.

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## 7. Comparative evaluation of the fungal-keeping properties of different cake preservatives

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### Abstract

Cake as a perishable food is a rich substrate for moulds and yeasts. One of today's challenges for the food industry is to guarantee safe food throughout the supply chain whilst retaining the nutritional properties. Hence the application of preservatives in food to maintain wholesomeness and freshness. This research assessed the fungal keeping property of four different preservatives in wheat flour cakes. Cakes were prepared from wheat flour using potassium sorbate, brandy, lime juice, and pawpaw wine as preservatives. Fungal population was determined, at 3-day intervals, on each cake product using standard cultural methods. The isolates were identified using cultural, microscopic and biochemical characteristics. Organoleptic evaluation of cake samples was conducted with a 9-point hedonic scale using a 7-member panel. At day 12, the lowest fungal population (5.11 log cfu/g) was observed in potassium sorbate-preserved cake and the highest (6.38 log cfu/g) was observed in brandy-preserved cake. The acceptability of the cake products by the panelists decreased with storage duration. The most acceptable cake was the brandy-preserved cake with an overall acceptability of 8.85, followed by potassium sorbate-preserved cake (8.75). Among the isolated fungi (n= 28), *Aspergillus fumigatus* was predominant (35.7%), followed by *A. flavus* (28.6%). This study indicated that potassium sorbate was the most effective of the studied preservatives. However, the effective fungal keeping property of pawpaw wine indicated its potential to satisfy the need for natural preservatives in cake production.

**Keywords: Preservative, fungi, keeping quality, potassium sorbate, lime juice, pawpaw wine.**

### Introduction

Cakes are sweet baked desserts prepared from flour (mostly wheat) and other ingredients, such as eggs, sugar, butter, and a leavening agent (Ubbor *et al.*, 2022). They are popular, delicious ready-to-eat snacks and are constant ceremonial items on joyous occasions such as birthdays and weddings. Cakes are increasing in demand for their different tastes, design, and aesthetics, with a global market growth rate of 1.5% per annum (Wilderjans *et al.*, 2013). It is, however, a perishable food that is prone to microbial spoilage particularly by fungi due to its rich content of carbohydrates, sugar and sometimes, condiments. The water activity (0.78 – 0.95) and acidity of cakes encourage fungal proliferation and the cake texture with its characteristic spongy nature is suitable for mycelia penetration and growth (Morassi *et al.*, 2018; Garcia *et al.*, 2021). Fungi that have been associated with contamination and spoilage of cakes include, *Penicillium citrinum*, *P. chrysogenum*, *P. crustosum*, *P. commune*, *P. brevicompactum*, *P. paxilli*, *P. glabrum*, *Aspergillus flavus* (Gonda, 2015; Morassi *et al.*, 2018). Fungal activities in cakes may result in ropiness due to slime formation, discolouration by mycelial growth, off-flavour and mycotoxins formation (which may occur even without any visible change in the cake) (Abdelhameed and Khalifa, 2024). Fungal spoilage of cake usually results in consumer rejection which has occasioned great economic losses to the cake manufacturer.

The general position is that microbial contamination of flour and flour mixture at pre-baking stage is usually eliminated by the baking process due to the enormous temperature of the oven (Morassi *et al.*, 2018; Gonda *et al.*, 2019). Baking, therefore, is a critical control point in ensuring the microbial stability of cakes. The major challenge to cake microbial stability is at the post-baking stage, due to product handling, exposure to the air, poorly sterilized equipment and faulty packaging (Morassi *et al.*, 2018). One of today's challenges for the food industry is to guarantee safe food through the supply chain while retaining the nutritional attributes of food. In order to ensure the protection of the microbiological integrity of cakes, and even other bakery products, premium has been placed on the use of preservatives (Garcia *et al.*, 2021). The preservatives that are commonly used in cakes include, potassium sorbate, calcium propionate, sodium bicarbonate, sodium benzoate, sodium metabisulphite and alcoholic drinks (e.g rum, and brandy) (Kikelomo, 2012; Okeke and Nwazuroko, 2014; Kumar *et al.*, 2015; Garcia *et al.*, 2021; Islam *et al.*, 2023). However, the increasing demand for natural products by consumers has shifted research focus to the use of alternative and/or natural preservatives in baking products, including cakes. Nisin and essential oils are some of the biopreservatives currently being studied for their ability to preserve cakes (Cama-Curasi *et al.*, 2022). The alternative preservatives of research interest in cake and bread preservation also include active packaging such as, oxygen scavengers and an ethanol emitter (Janjarasskul *et al.*, 2016; Mugasundari and Anandakumar, 2022). Fermented pawpaw fruits have many ethnomedicinal uses, one of which is in the treatment of ulcers and gastroenteritis (Owoyele *et al.*, 2013). Since it contains alcohol, it possible application in cake preservation as an alternative preservative, informed its selection among the preservatives in the present study. Preservatives differ in their ability to protect the microbiological integrity of food and thus the present study evaluated sorbic acid (potassium sorbate), lime juice, pawpaw wine, and brandy for their fungal keeping ability in wheat flour cakes.

## Materials and methods

Mama gold wheat flour and other ingredients for cake production were purchased at local retail stores in Ikotun, Lagos State. Potassium sorbate (prepared at 0.1%) and brandy (40% alc/vol) were bought respectively at Gannylab Scientific and a retail store in Lagos. Pawpaw wine ( $12.80 \pm 0.02\%$  alc/vol) and lime juice were produced in the Laboratory using the methods of Awe (2011) and Nwanekezi *et al.* (2014) for pawpaw wine and Jittanit *et al.*, (2013) for lime juice.

## Production of Cake

The method of Abegunde *et al.*, (2019) was used with some modification. The margarine and sugar were thoroughly mixed in a bowl (bowl A) using a sterile locally made wooden stick. Milk, beaten eggs and preservatives were added to the mixture and thoroughly mixed with a whisk. In another but smaller bowl (bowl B), wheat flour was finely mixed with baking powder and salt. The content of bowl B was carefully transferred into bowl A and repeatedly kneaded to mix the mixture. The prepared mixture was measured out into three cake-baking pans that had been greased. The filled baking pans were then placed in an oven at 190°C for 15 minutes. This procedure was done with each of the preservatives.

## Enumeration of fungi in cake products

A 500g sample of each cake product was taken immediately after production and at 3day intervals and mashed

using a sterile pestle and mortar. Ten (10) grams of mashed cake was weighed using a chemical balance and aseptically added to 90 ml sterile water and properly mixed. One milliliter of the dilution was aseptically pipetted and introduced into 9ml sterile water to make the  $10^{-1}$  dilution and this was further diluted to the  $10^{-4}$  dilution. Aliquot (1ml) of the  $10^{-4}$  dilution was aseptically inoculated on sterile potato dextrose agar (PDA) using pour plate method. The plates were incubated at 28°C for 72h after which colonies were counted and the colony forming units per gram (cfu/g) was determined. Distinct colonies were subcultured to obtain pure cultures. The isolates were identified using plate morphology and microscopic characteristics (with the lactophenol cotton blue stain) (Samson *et al.*, 2000)

### Organoleptic evaluation of cake products

A 7-member sensory panel, comprising volunteer students in the Department of Microbiology, LASU was constituted for the organoleptic evaluation of samples of the cakes. Degree of acceptance or likeness based on appearance, texture, taste, flavour, and overall acceptability was expressed on a 9-point Hedonic scale (where; 1= extremely dislike, 2= very much dislike, 3= moderately dislike, 4= slightly dislike, 5= neither like nor dislike, 6= slightly liked, 7= moderately liked, 8= very much liked, 9= extremely liked).

### Statistical analysis

The statistical analysis was carried out using the analysis of variance (ANOVA) (of the SPSS software version 24.0) to compare the mean values of organoleptic properties across the different cake products. The ANOVA was chosen because it allows the determination of any significant difference in means among multiple groups.

## Results

### Fungal population of cake products in storage

At day 12 (end of storage period), the lowest fungal population was 5.11 log cfu/g recorded in potassium sorbate-preserved cake and the highest fungal population was 6.38 log cfu/g in brandy-preserved cake (Table 1).

**Table 1: Fungal population of cake containing different preservatives with days of storage**

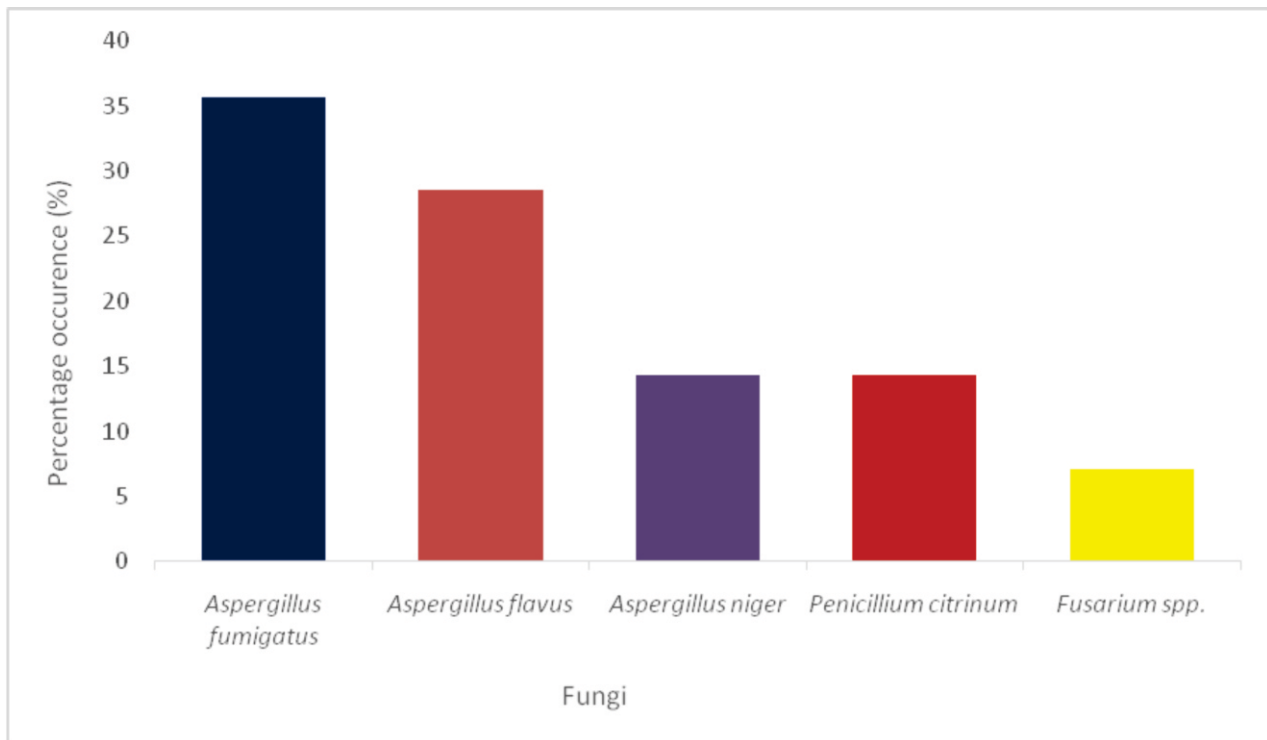
Storage days	Fungal population (Log cfu/g)				
	Control	Cake B	Cake LJ	Cake PW	Cake PS
0	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
3	3.84±0.12	2.54±0.04	2.47±0.03	2.45±0.01	2.36±0.00
6	4.73±0.15	4.70±0.01	4.50±0.01	3.80±0.12	3.55±0.02
9	6.35±0.01	5.45±0.01	5.28±0.01	5.23±0.03	5.04±0.03
12	7.43±0.01	6.38±0.01	5.88±0.01	5.87±0.03	5.11±0.03

Each value is the mean of 3 determinations

NB: Cake B = brandy-preserved cake, Cake LJ = Lime juice-preserved cake, Cake PW = pawpaw wine-preserved cake, and Cake PS = potassium sorbate-preserved cake. All the cakes did not exhibit significant ( $p > 0.05$ ) spatial variation over the storage days.

### Percentage occurrence of fungi in the cakes.

Table 2 shows that *Aspergillus fumigatus* was predominant among the 28 fungal isolates with 35.7% occurrence, followed by *Aspergillus flavus* (28.6). The least occurring was *Fusarium spp* (7.1%).



**Figure 2: Percentage occurrence of fungi in the cake products.**

### Organoleptic evaluation of the cake products

The results in Table 3 show that the Brandy-preserved cake was the most acceptable with an 8.85 overall acceptability value, followed by potassium sorbate-preserved and pawpaw wine-preserved cakes with 8.75 and 8.30 respectively.

**Table 3: Organoleptic quality of wheat flour cake with different preservatives**

Parameters	Control	Cake B	Cake LJ	Cake PW	Cake PS	Mean Difference	Sig.
<b>Day 0</b>							
Appearance	9	9	9	9	9	8.50000	0.0000
Texture	9	9	9	9	9		
Sweetness	8	9	8	8	9		
Flavour	8	9	8	8	9		
<b>Day 3</b>							
Appearance	9	9	9	9	9	8.50000	0.0000
Texture	9	9	9	9	9		
Sweetness	8	9	8	8	9		
Flavour	8	9	8	8	9		
<b>Day6</b>							
Appearance	7	9	9	9	9	8.75000	0.0000
Texture	7	9	9	9	9		
Sweetness	7	9	8	8	8		
Flavour	7	9	8	8	9		
<b>Day 9</b>							
Appearance	6	9	9	8	9	8.25000	0.0000
Texture	5	9	9	9	9		
Sweetness	6	9	8	8	8		
Flavour	5	9	8	8	9		
<b>Day 12</b>							
Appearance	5	7	7	7	8	7.75000	0.0000
Texture	4	8	8	7	9		
Sweetness	4	9	9	8	7		
Flavour	4	9	9	9	9		
<b>Overall acceptability</b>	<b>6.75</b>	<b>8.85</b>	<b>8.45</b>	<b>8.30</b>	<b>8.75</b>		

Each value is the mean of 7 determinations

Cake B = brandy-preserved cake, Cake LJ = Lime juice-preserved cake, Cake PW = pawpaw wine-preserved cake, and Cake PS = potassium sorbate-preserved cake.



## Discussion

Food safety entails the elongation of food shelf life and the delivery of safe food to consumers. To achieve these objectives, preservatives are added to food products and in recent times, the use of natural products as preservatives is gaining increasing attention. Thus, research studied the ability of two common cake preservatives (potassium sorbate, and brandy) and two natural products (lime juice, and pawpaw wine) to control fungal proliferation in wheat flour cakes.

Potassium sorbate was the most effective among the test preservatives in inhibiting fungal growth in the studied cake products, followed by pawpaw wine since the cake preserved with potassium sorbate (cake PS) had the lowest fungal population at the end of the storage duration. Also, the fungal population in the cake PS and cake preserved with pawpaw wine (cake PW) remained within the satisfactory limit of 4Log cfu/g [stipulated by the Centre for Food Safety, (2014)] on the 6<sup>th</sup> day of storage and remained within acceptable limits of 4 to 6Log cfu/g throughout the studied duration of 12 days. Also, there was no significant ( $p > 0.05$ ) spatial variation in the cake fungal populations over the storage days.

This outcome is in agreement with previous reports indicating that potassium sorbate is effective in inhibiting the growth of spoilage fungi of cakes and other bakery products (Kumar *et al.*, 2015; Garcia *et al.*, 2021). The inhibitory effect of pawpaw wine on the cake spoilage fungi may be due to its alcoholic content since alcohol (ethanol) has been reported to effectively reduce the fungal population in rice cakes (Oh and Kim, 2021). Brandy and lime juice were not as effective as potassium sorbate, and the pawpaw wine in limiting the fungal population in the cake products, since the fungal population of the lime juice and brandy preserved cakes (cakes LJ and Cakes B respectively) only remained satisfactory till the 3 days of storage and while the fungal population of the Cakes LJ remained within acceptable limits even at day 12, the fungal population of the cakes B exceeded the acceptable limit at day 12. The more effective fungal-keeping property of cake PW than cake B, suggests that ethanol may not be the sole antifungal constituent of the pawpaw wine, since *Carica papaya* fruit extracts have been reported to have antifungal activity (Aljuhani *et al.*, 2024).

In the present study, the isolated fungi, in order of prevalence were *Aspergillus fumigatus*, *A. flavus*, *A. niger*, *Penicillium citrinum*, and *Fusarium* sp. This result is similar to that of Morassi *et al* (2018), who reported *A. flavus*, *P. citrinum*, *P.paxilli*, and *A. niger* from wheat cakes. However, the authors reported *A. flavus* as the predominant fungus. The differences in the results of the studies may be attributed to differences in the environment of production and storage, exposure, and handling of the cake products. Similarly, Williams *et al.*, (2020) reported the genera; *Aspergillus*, *Fusarium*, and *Penicillium* among others, as contaminants of bakery products which included cake. However, Sudawa *et al.*, (2022) reported the presence of *Mucor* spp and *Rhizopus* spp (which were not found in the present study) in addition to *Aspergillus* spp and *Penicillium* spp in cakes sold in Kano, Nigeria. The differences in the mycobiota of cakes in the present study and that reported by Sudawa *et al.*, (2022) may be attributed to different conditions of exposure and handling of the cake products. This is because microbial contamination of cakes occurs post-baking due to improper exposure and handling (Morassi *et al.*, 2018).

All the preserved cakes were generally acceptable throughout the study period since their acceptability scores were 7 and above and there was no significant ( $p > 0.05$ ) spatial variation in the organoleptic qualities of the

cakes. However, the control cake was no longer acceptable on day 9 and its overall acceptability fell short of the acceptable score of 7. One implication of the outcome of the sensory analysis is that, preservatives is important in ensuring the microbiological stability of cake, and also that preservatives do not negatively affect the organoleptic properties of cake (Okeke and Nwazuroko, 2014; Islam *et al.*, 2023), irrespective of the increasing consumer preference for natural preservatives which is based on health concerns.

The Brandy-preserved cake was the most acceptable based on the sensory analysis. This may be due to the likely flavour enhancement of the cakes by brandy. It has been reported that, some natural preservatives do not only possess antimicrobial, or antioxidant properties but also positively impact the flavour of the product (Erseda *et al.*, 2023).

## Conclusion

This study indicated that potassium sorbate was the most effective of the studied preservatives. However, the effective fungal-keeping property of pawpaw wine indicated its potential to satisfy the need for natural preservatives in cake production. Thus, pawpaw wine is recommended for application as a natural preservative in cakes.

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## 8. Russian-Ukraine War: An Albatross to Achieving 2030 SDGs 1 & 2 in Nigeria

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### Abstract

International conflicts between opposing countries cause damage, harm, and impediment to economic, social and political progress. The Russian Ukrainian conflict has significantly impacted Nigeria's Sustainable Development Goals (SDGs) 1 and 2, which aim to end hunger and poverty by 2030. Embracing the qualitative research method, which involves the collection and analysing non-numerical data to understand the problem, this study reveals that the conflict has led to economic disruptions, business spin, food insecurity, worsening foreign exchange, diverted resources, and high energy costs. The war's volatility in the world food system has exacerbated Nigeria's food security, obstructing the achievement of SDGs 1 (No Poverty) and SDG 2 (Zero Hunger). To alleviate the conflict's effects, this paper suggested that Nigeria should focus on diversifying the economy, investing in indigenous farmers, reducing reliance on sectors open to external shocks, and investing in sustainable agriculture methods. Improving food security measures, such as domestic food production and agribusiness, is crucial for a stable and resilient food supply. This paper concludes that the Russian-Ukraine war is a gargantuan albatross to Nigeria's progress towards SDGs 1 and 2.

**Keywords:** *International conflict, Sustainable Development Goals, Food Security and Nigeria.*

### Introduction

Prior to the onset of the Russia-Ukraine conflict, the Organisation for Economic Cooperation and Development (OECD) (2022) made a forecast indicating that in the aftermath of the coronavirus epidemic, a substantial portion of key global macroeconomic indicators will return to their pre-pandemic levels by the years 2022-2023. Development groups worldwide have issued warnings indicating that low-income nations, such as Nigeria, could have significant adverse consequences due to the crisis in Ukraine (International Food Policy Research Institute, 2022; Garver, 2022). Both Russia and Ukraine have caused disruptions in the international trade of several crucial commodities, including wheat, cereal grains, energy, and fertilizer, which are traded on a large scale (IFPRI, 2022). The escalation of global supply chain disruptions has given rise to unprecedented challenges, particularly in the context of limited or non-existent product movement through the ports on the Black Sea connecting the two nations. These challenges are further compounded by restrictions on food exports in Ukraine and the imposition of severe economic sanctions against Russia (Bin-Naswhan, Hassan, & Muneeza, 2022). The situation become more severe because Russia and Ukraine play a significant role in global wheat production, accounting for around one-third of the world's wheat supply. The ongoing conflict that started in late February 2022 has had a destabilizing effect on the grain market, introducing volatility and uncertainty. Now in the third year since Russia had its boots in Ukraine, the continuous escalation of hostilities in the ongoing conflict between Ukraine and Russia continues to have a significant effect on the fluctuation of food prices (including wheat and grains) particularly in the low- and middle-income nations, who are engulfed in the food crisis caused by the war. According to Mark Welch, a grain economist at the Texas A&M AgriLife Extension Service in Bryan-College Station, the likelihood of ongoing war or its intensification is expected to exacerbate the volatility of global wheat prices and exert an impact on the production of wheat in the United States in the year 2024 (Russell

& Russell, 2023).

Russia and Ukraine play significant roles as primary suppliers of agricultural commodities to the African continent. The nations of North Africa (Algeria, Egypt, Libya, Morocco, and Tunisia), Nigeria in the West African region, and Ethiopia and Sudan in East Africa collectively constitute 80 percent of the total wheat imports from the countries (Mlaba, 2022; (GO, 2022). Nigeria is particularly susceptible to the prevailing surge in global food prices. The nation under consideration is widely recognized as the most densely populated country and possesses the greatest economy inside the African continent, with a population of over 217 million individuals. Like many political systems in sub-Saharan Africa, Nigeria exhibits a significant prevalence of poverty, as evidenced by a poverty rate of 42.6% and a high unemployment rate of 33%. Additionally, Nigeria faces the dual challenges of severe food crises and malnourishment, as indicated by a study conducted by Ecker et al. (2021). The United Nations Children's Fund (UNICEF)-World Health Organisation (WHO)-World Bank Group estimates further reveals that in 2022, 34.2% of children under the age of five in Nigeria suffer from stunted growth, 2.2% are overweight, and in 2020, 6.5% are wasting (UNICEF et al., 2023). In the face of these challenges, there is a likelihood that the Russia-Ukraine conflict will further exacerbate the Nigeria food crisis.

The sudden surge in food prices has had a significant impact on consumers, leading to serious consequences. Based on various research findings, it has been seen that the increase in 2010 had a comparable effect on a population of 44 million individuals, like the surge saw in 2007. This occurrence perhaps had a role in an additional 155 million individuals experiencing acute hunger and deprivation. Prices have experienced comparable growth to that observed in 2010 up until the present day. Based on recent research conducted by the Centre for Global Development, it has been determined that the elevated prices of food resulting from the conflict might potentially lead to a significant number of individuals, estimated to be no less than 40 million, facing acute hunger and seeing a decline in their socioeconomic status (Mitchell et al. 2022). The Food and Agriculture Organization of the United Nations (FAO) (2022) explicitly acknowledged this fact when it released its third consecutive food price index on April 8, 2022. The current prices of food have seen a significant increase of 34% compared to the same period of the previous year. This surge is the highest recorded level since the start of data collection by the Food and Agriculture Organization (FAO).

In January 2023, global food prices had a decline for the eleventh consecutive month. However, it is noteworthy that food inflation in Africa's largest economy has shown a persistent upward trend. According to the statistics office of the nation, the escalation in food inflation may be attributed to the surge in prices of various food items such as bread and cereals, oil and fat, potatoes, yam and other tubers, fish, vegetables, fruits, meat, and food goods (Odifa, 2023). However, the inverse relationship between the rise in the price of food in Nigeria and the decline in global food prices in the early time of the year may not be attributed to the resultant effects of the Russia-Ukraine war, but due to factors such as the hike in the cost of energy, rising cost of inputs for fertilizer production, high cost of transportation, rising interest rate, and shortage of currency notes. However, this is not peculiar to Nigeria alone. There is no indication of global subsiding food price inflation.

According to Vos et al. (2023), while concerns of an extended period of elevated global food prices have partially diminished about 2 years of the Russia-Ukraine war, there are still eight significant apprehensions of the security of food supply. First, it is noteworthy that prices for food items continue to exhibit a level of elevation that surpasses historical benchmarks. Second, the current state of staple food markets is constrained due to the persistent uncertainty surrounding the availability and export potential of grain reserves kept in Ukraine amidst the ongoing conflict. Third, the decrease in wheat cultivation during the autumn season of 2022 may potentially exert a substantial adverse influence on the subsequent spring planting activities. Fourth, fertilizer costs have experienced a decline from their previous highs, however, they continue to maintain a relatively elevated level, even considering the recent decrease in natural gas prices. This is particularly significant as natural gas serves as a crucial component for nitrogenous fertilizer and serves as an energy source throughout the manufacturing process. The decline in output prices of essential food items has resulted in a decrease in farm profitability due to the persistently high input costs. This is anticipated to result in a decrease in the utilization of fertilizers, therefore impacting crop yields, particularly those of rice, wheat, and maize. Fifth, the southern hemisphere has experienced poor climatic circumstances that have coincided with extended periods of drought in Argentina and East Africa. Consequently, the projected production prospects for wheat and other crops in 2023 have significantly declined in comparison to the previous year. Sixth, it is anticipated that the world economy experience a substantial deceleration in 2023, which could potentially lead to a further decline in global food consumption. African nations where there are conflicts, that are experiencing occurrence of unexpected and extreme weather events and cannot import may continue to experience food shortages. Seventh, restrictions on import and slowdown of food production, and eight, challenges faced by low-income nations regarding persistent macroeconomic issues, which further worsen the dangers associated with food security. High debt and debt service obligations, rising food and energy import prices, and devaluation of the currencies in these nations have further exacerbated the issue of domestic food price inflation.

The discourse surrounding the Russia-Ukraine conflict often fails to adequately address the Sustainable Development Goals (SDGs). In this discourse, Balbaa (2022) examines the ramifications of the conflict on the global economy, although fails to establish a connection between their analysis and the Sustainable Development Goals (SDGs). In their study, Duho et al. (2022) investigated the ramifications of the conflict but neglected to extend the discourse to encompass food-related elements. The artwork titled "Ehsas" (2022) employs far-reaching brushstrokes to create a visual composition on a global scale. However, the potential exacerbation of food and poverty difficulties resulting from the war were not considered. The ripple effect of the war is also not considered in the forthcoming agricultural season in Africa. The cost and accessibility of fertilizers will play a crucial role in addressing the prevalent issue of food insecurity across the continent. Malpass (2023) posits that the exorbitant cost of fertilizers is a significant challenge for most farmers, hence jeopardizing the agricultural cycle and overall stability of rural areas. Therefore, the current issue of elevated fertilizer costs is impeding the successful execution of the crop cycles scheduled for 2023 and 2024, consequently, elevating the cost of food. The issue of economic development has already posed challenges in several emerging economies, particularly in the African continent. Mlaba (2022) is a reference to a certain source or author. This inquiry seeks to examine the potential consequences of the ongoing conflict between Russia and Ukraine on Africa, however, fails to delve



more into the pressing problems of poverty and famine, which are significant concerns within the region. The early two Sustainable Development Goals (SDGs). Yet, no comprehensive research has been conducted to investigate the potential threats posed by war. The hindrance of worldwide endeavours in attaining the Sustainable Development Goals (SDGs) by the year 2030 is a source of frustration. This research emphasizes Nigeria. This analysis critically examines the war within the framework of the Sustainable Development Goals (SDGs).

The main aim of this research project is to provide a thorough assessment of the influence of the Russia-Ukraine conflict on Sustainable Development Goals (SDGs) 1 and 2, with a particular emphasis on the country of Nigeria. The study also examined the methods by which stakeholders may aid the Sustainable Development Goals (SDGs) in difficult situations. The present study has five discrete components. The next part, referred to as Part 2, presents a comprehensive explanation of the research methods utilized in this work. The examination of the impact of the conflict between Russia and Ukraine on Sustainable Development Goals 1 and 2 may be in Sections 3 and 4. The concluding section of the publication comprised a concise overview of the research outcomes and put forward recommendations for further steps.

### **Research Method**

The main aim of this study is to offer social and economic policy practitioners with significant insights obtained from the results of the conflict between Russia and Ukraine. During the initial phase, the author performed a preliminary empirical inquiry to determine patterns related to the influence of the conflict on Sustainable Development Goals 1 and 2. The current study utilized library research approaches to acquire and assess up-to-date secondary sources, including newspapers, textbooks, articles, reviews, and reports, that refer to the influence of the conflict on Sustainable Development Goals 1 and 2 (No Poverty and Zero Hunger). Moreover, the researchers have proposed a set of suggestions to effectively safeguard the Sustainable Development Goals (SDGs) and promote significant progress for people and the international society by the year 2030, drawing on their empirical research. The technique applied in this study was based on a careful selection of academic sources that employed the secondary research strategy.

### **Russia-Ukraine War as an Albatross for Sustainable Development Goal One (Poverty Elimination) in Nigeria**

The incursion of Russia into Ukraine has harmed Nigeria's previously optimistic recovery from the COVID-19 epidemic. Consequently, food and fuel prices have increased, trade disruptions surfaced, the financial space available for green transitions got constrained, and there has been a decrease in the amount of funding available for international development (Abend 2022; Lusigi 2022; Sen 2022). It is a problem because Nigeria depends on Russia and the Ukraine to import basic supplies like wheat, grains, steel, and fertilizers. Nigeria suffers food crisis due to disruption in the flow of these items. According to Luigi (2022), the actual effect on any economy is directly proportionate to how much it relies on tourism, imported grain and fertilizers as well as oil and gas exports or imports among others. There are enormous obvious long-term effects, including the potential for realignment in geopolitical power, socio-economic instability, and unmanageable debt rates, which may lead to

increased inequality and high poverty levels in Nigeria (Esfandabadi et al. 2022). The current high inflation level, skyrocketed gasoline and food prices, as well as the instability of the financial system, are the war's most noticeable repercussions in less income countries including Nigeria.

The volatility of food prices is crucial in relation to issues such as famine, poverty, and worldwide malnourishment. Low-income households allocate a substantial portion of their budget to purchasing food, but the exorbitant price of this item constrains their purchasing power. The deteriorating global food outlook due to the implementation of more stringent policies by nation-states explain the threat to achieving Sustainable Development Goal 1.

Due to a significant amount of its budget going toward imported food and transportation, Nigeria as one of the lowest incomes countries in the world suffers the most. The likelihood of food insecurity persisting is considerable and threatens several aspects of human development including health, income and education (Kagan et al. 2022). According to the UN Global Crisis Response Group's predictions for energy, food, and finance, there will be a global crisis in living standards. Food prices, energy prices, and financial circumstances are expected to rise, contributing to this disaster (Lusigi, 2022). To stabilize the commodities markets, resolve the growing consequences of debt, and concurrently strengthen the ability of people and nations to deal with the crisis, a global response is needed. Sen (2022) stated that in 2021, Kenya imported approximately 30% of its national wheat from Russia and Ukraine. In something that has semblance to Nigeria's case, as a result, a disruption in the supply chain might influence Kenya's ability to produce bread, which is the 3<sup>rd</sup> most popular food item there. According to Behnassi and El Haiba (2022a, b; Sen, 2022) and other sources, Russia supplied 44% of all the fertilizer imported by Cameroon in 2021.

West Africa's capacity to feed its people would allegedly be threatened by the conflict, which would obliterate crop output there. Like this, according to (Duho et al.2022), 60% of Ghana's imports of steel and iron ore come from Ukraine. According to Kirby (2022) and others, the conflict has already caused significant difficulties for Ghana's construction sector. According to Ben Hassen and El Bilali (2022), the Russia-Ukraine violent conflict, which includes two big world agricultural powers, has several adverse socio-economic impacts that are being felt globally and might get much worse, especially for global food security. Due to COVID-19 epidemic-related supply chain disruptions, high global demand, and subpar harvests in certain political systems, the war took place at the wrong time for the world's food markets. The reason is that these identified factors have already contributed to rising food costs.

Additionally, Ben Hassen and El Bilali (2022) asserted how essential it is to comprehend the overall impact on global food security to uncover the impact of disruptions in the markets for food and fertilizer caused by war or other forms of violent armed conflict affect the cost and availability of these commodities. As claimed by Berahab (2022), hostility brought direct and significant repercussions for the security of the world's food supply. Due to the conflict, Ukraine's exports have been interrupted, population dislocation and conscription have resulted in labour shortages, accessibility to fertilizer has been hampered, and the prospects for future crops are questionable (Mlaba 2022; Wax 202).

Ben Hassen and El Bilali (2022) gave similar conclusion that Ukraine's export capacity has decreased. Second, compelled military service and demographic shifts contributed to a deficiency in the farm labour force. Thirdly, it may be difficult to acquire access to necessary agricultural supplies like fertilizers (One Africa 2022; Walker, 2022). The fact that the conflict resulted in a panic purchasing movement on both the national and individual levels was another problem that Ben Hassen and El Bilali (2022) brought to light. Both authors highlighted the importance of this topic. This development is jeopardizing the realization of the Sustainable Development Goals, especially SDG 1 which intends to end poverty, SDG 2, which seeks to end hunger as well as SDG 12 striving to encourage responsible consumption and production.

According to Balbaa *et al.* (2022), the global food systems' inherent vulnerabilities, rigidities and inefficiencies exacerbate the effects of war on food security. People across the globe are now in an even more vulnerable condition because of this. Owing to this, suggested by Ben Hassen and El Bilali (2022), the implementation of policies and reforms that are both short-term and long-term focused will be necessary to support the transition to food systems that are equitable, healthy and environmentally sustainable.

In ways that threatens the achievement of Sustainable Development Goal 1, the Russia-Ukraine war has impacted the living standard of Nigerians in the following areas:

- i. The ongoing conflicts have significantly disrupted global supply chains, especially for countries like Nigeria that are heavily involved in business with the warring parties. According to (Russia (RUS) and Nigeria (NGA) Trade | the Observatory of Economic Complexity, n.d.), Russia's exports to Nigeria in 2021 amounted to \$1.25 billion. Russia primarily exports Refined Petroleum (\$503M), Wheat (\$493M), and Potassic Fertilizers (\$71.4M) to Nigeria. Over the past 25 years, Russia's exports to Nigeria have shown a consistent annual growth rate of 16.5%, rising from \$27.3 million in 1996 to \$1.25 billion in 2021. Ukraine's exports to Nigeria in 2021 amounted to \$595 million, mostly made of wheat, hot-rolled iron, and iron blocks (The Observatory of Economic Complexity, n.d.).
- ii. Constraints to supply due to geopolitical tension have pushed up global commodity prices. This has generally fueled global inflation. There has been a steady increase in the price of staple foods such as wheat-based food items, grains, vegetable oil, and sugar, as well as energy, fertilizer, etc.
- iii. There conflict has bred business uncertainties which has made investors seek safe-havens, and this could prompt capital outflows from emerging markets, including Nigeria.
- iv. Resource diversion to sustain staple food supplies such as wheat, grains, etc. According to the Foreign Agricultural Service, Nigeria is allocating a greater portion of its budget towards the importation of wheat. Consequently, other key sectors of the economy are starved of funds to implement its annual goals.

Consequent upon this, Nigeria has witnessed:

- a. **Income and Employment Loss:** The rising costs of natural gas in Africa's industrial sector pose a significant challenge to businesses relying on it for chemical and fertilizer production. Unreliable power from the national grid has increased expenses, forcing stakeholders to increase product and service costs,

and experienced shut down for not being able to cope with the high cost of production.

- b. Increased Underemployment: Many people are in unproductive jobs, leading to economic stagnation and challenges in overcoming poverty and improving their socio-economic circumstances.
- c. A reduction in government social spending programmes such as education and healthcare, that help lift people out of poverty.
- d. Effect on the Informal Sector. A considerable proportion of the population in several developing nations is engaged in the informal sector, a sector that is frequently more susceptible to economic shocks. Economic recessions have the potential to result in less demand for goods and services within the informal sector, so impacting the livelihoods of individuals dependent on this sector.

According to (Sachs, et al., 2024), Nigeria is ranked 146 out of 166 nations in the SDG Index. Under SDG 1 (No Poverty), the report states that the major challenges (part of which is the Russia-Ukraine war) to ending poverty remain. This indicates that the nation has not made a significant improvement in elevating poverty since the war between Russia and Ukraine, rather it is rising. Figure 1 below shows that 32% of 220,631,542 of the country's population are living in poverty, out of which 89% are living in the rural areas, while 11% are living in the urban areas. Out of the population living in poverty, 49% are female, while 51% are male (World Poverty Clock, n.d.). poor citation Before the war in 2020, it was 30% of the total population and 26% in 2019.

### **Russia-Ukraine War as an Albatross for Sustainable Development Goal Two (Zero Hunger) in Nigeria**

War reduced Nigeria to a net food importer. The increase in food insecurity hurts mobility, conflict, displacement, and poverty in Nigeria. A lot of pressure is on many countries, which are now unable to fund their efforts to end hunger (Berahab 2022). Nigeria is now more susceptible to fluctuations in the price of grain and fertilizer due to the conflict between Russia and Ukraine (Ehsas 2022). According to projections from the United Nations Conference on Trade and Development (UNCTAD), between 2018 and 2020, Russia exported 32% of the entire amount of wheat to Africa, while Ukraine exported 14% of that amount. Countries in North Africa, including Tunisia and Egypt, are dependent; yet the sub-Saharan African region's economic precarity increases its level of vulnerability (Pinto 2022).

The 2022 Global Report on Food Crises revealed that Nigeria is one of the 10 nations with the largest number of people experiencing food insecurity. The report findings, which include 21 of Nigeria's 36 states and the Federal Capital Territory, indicated that 12.94 million individuals experienced severe food insecurity between October and December 2021. According to research conducted by the International Food Policy Research Institute (IFPRI) on the impact of COVID-19 on food security in Nigeria, COVID-19-induced shocks alone have increased Nigerian family vulnerability and food insecurity (Balana et al., 2022).

Food security is largely determined by transportation costs, which are increasing due to rising oil prices (Ehsas 2022; Ozili 2022a). Even oil-exporting countries like Nigeria find it difficult to immediately offset the consequences of rising food costs. According to the Food Price Index published by the United Nations Food and Agriculture Organization (FAO), grain prices have hit an all-time high. The cost of grain and fertilizer grew by 48

and 35%, respectively, from March 2019 to March 2022. According to the course of events, commodities conflicts will have a significant impact in the near future. Nigeria, which already faces significant population challenges, a heavy reliance on imports, unstable economic conditions, and unpredictable political climate, stands to lose the most from this potential. In Sub-Saharan Africa, which comprises most of the continent and has a population of about 1.1 billion (Lusigi 2022; Pinto 2022). The price of grain and fertilizer has recently increased due to several factors, including the global health crisis and the economic responses required to address it, energy market volatility, and infection, all of which were exacerbated by the effects of Russia's invasion of Ukraine (Pinto 2022). In a location where the cost of food accounts for 40% of overall consumption expenses, rising grain prices have been the main cause of epidemics. Food is an inelastic good, meaning that price increases do not result in a proportionate drop in demand. People require food to stay alive. In this situation, the effect is especially damaging in metropolitan regions with a high concentration of low-income households in Nigeria. Because they depend on unstable sources of income and have low savings levels, these households are particularly vulnerable to price fluctuations (Sen 2022; Pinto 2022).

The cost of some forms of fertilizer more than doubled at the start of the conflict and finally reached an all-time high. This also happened at the same time as natural gas prices rose and there were concerns about sanctions, production, and transportation problems. The export of ammonium nitrate was already prohibited by the Russian government before to their invasion of Ukraine in February. To ensure sufficient supplies are kept within the nation, the Chinese government also intends to outlaw all fertiliser exports starting in the summer of 2021 (Abu Hatab 2022; Pinto 2022). According to Luigi (2022), supply limitations are to blame for the source of the food and fuel shortages. Supply constraints that go beyond the crisis now in progress are to blame for the rise in food and fuel insecurity. Before this catastrophe, there was a famine that affected the supply of food (Ripley 2022). The root causes of the issue include climatic variability, inadequate supply system recovery on a global and regional scale, and poor productivity. While numerous places of West Africa and Southern Africa were affected by excessive precipitation levels and flooding in 2022, a significant chunk of the Horn of Africa saw below-average rainfall. The floods in Q4 2022 had a substantial impact on the agricultural region of the nation, causing extensive damage to significant hectares of land, including cropland, as well as agricultural supply-chain infrastructure. This led to huge losses in the post-harvest period. This occurrence led to a substantial increase in domestic food costs and had a detrimental effect on the ability of households to access and afford food.

The availability of food in one section of a nation or continent cannot be transported to other regions of the same country or continent where it is most needed due to insufficient infrastructure. As a result of low productivity from inadequate input and technology utilisation, a sizable chunk of Nigeria's agricultural economy is operating below widely adjudged potential. Additionally, there is significant post-harvest loss and waste due to inadequate agro-processing, insufficient storage, and strategic reserves.

Armed conflicts, according to Behnassi and El Haiba (2022), might be the main cause of food shortages in a globalized society, affecting areas outside of the battlefield. They argued that since armed conflicts were happening more often, the food crises of the past ten years have highlighted the structural issues with the fight

against food poverty in unstable contexts. Behnassi and El Haiba (2022) said that at a time of globalization, military conflicts may be the main cause of food shortages that affect areas outside of those directly affected. Behnassi and El Haiba (2022) also claimed that the continuing conflict between Russia and Ukraine has brought to light endemic flaws in global food security while also causing fresh occurrences of hunger. Conflicts make it harder for countries, households, and people to satisfy their nutritional needs. These disagreements may impede attempts to grow and gather food, prepare and transport it, supply and sell it, and other related activities. Jagtap, Trollman, Trollman, Garcia-Garcia, Parra-López, Duong, and Afy-Shararah (2022) conducted research on how the conflict between Russia and Ukraine has affected the effectiveness and flexibility of the world's food supply systems. Food is one of the most traded commodities, and following the COVID-19 effect, the situation in Ukraine, one of Europe's breadbaskets, has caused a significant further disturbance in the world's food supply systems. A long-lasting effect resulted in the disruption of the food supply chains, availability, and pricing in Nigeria.

According to Jagtap et al. (2022), the war is endangering the supply and availability of a wide range of raw materials and finished food items. Additionally, recent price increases for food have been seen in marketplaces throughout the world. Additionally, according to Jagtap et al. (2022), the conflict between Russia and Ukraine has harmed food supply chains, having significant effects on production, sourcing, manufacturing, processing, and logistics, as well as significant shifts in demand among nations that depend on imports from Ukraine. Due to the conflict and the international sanctions placed on Russia, the world's supply chain has been hampered. As a result, Africa is currently dealing with energy and food shortages, rising prices for commodities, and soaring inflation, all of which pose a threat to worsen the region's severe poverty and hunger (IMF,2022).

Considering the prevailing situation, the lack of combative actions by African nations to reduce its dependence on imports, reduce the effects of climate change, and check internal crisis, as well as the slow response to the resultant effects of the ongoing war between Russia and Ukraine, the major challenges to achieving SDG 2 (Zero Hunger) has remain. Sachs, et al. (2024) posit that there is a decrease in the prevalence of undernourishment. While the long-term objective is set at 2.5% by the Food and Agriculture Organisation (2020), Nigeria fell from 6.6% in 2007 to 12.7% in 2020. According to (Statista, 2023), it further decreased to 15.9% between 2020-2022 (see Figure 1). Furthermore, there is an increasing occurrence of severe food insecurity between 2020-2022, partly owing to the Russia-Ukraine crisis.

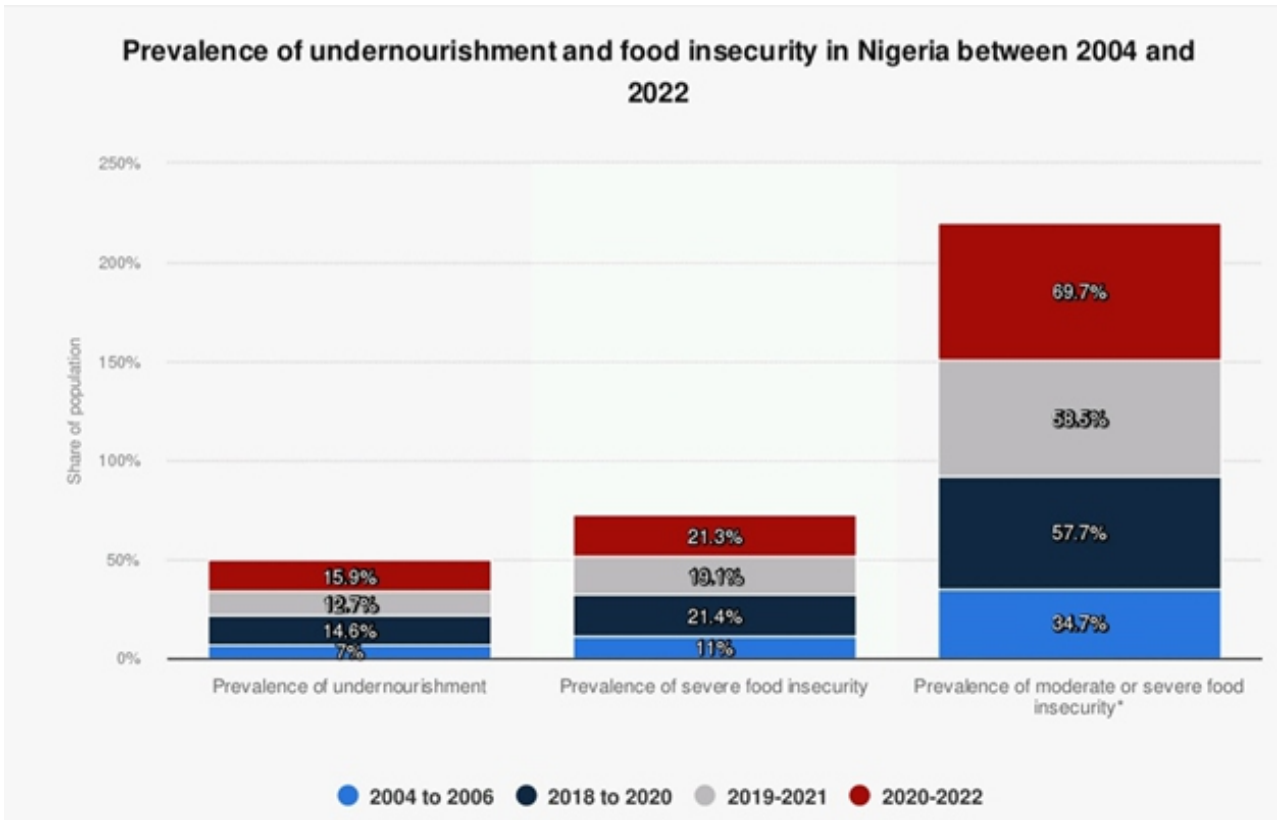


Figure 1.

Source: Nigeria; UNICEF; FAO; 2004 to 2022

The number of people who are undernourished has continue to rise in Nigeria before and during the Russia-Ukraine war (see figure 2). The crisis further revealed how vulnerable African nations' economies are as many of them are bedeviled by food insecurity.

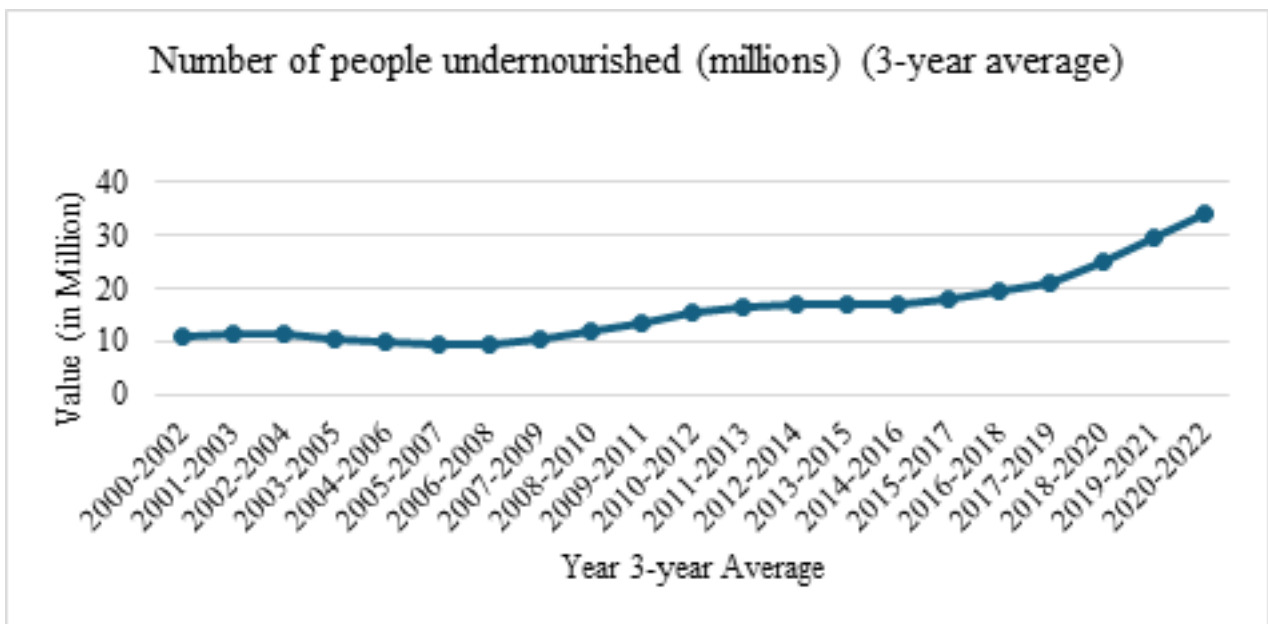


Figure 2.

Source: (Food and Agriculture Organisation of the United Nations, 2024)

## Concluding Remark

The current studies on the Russia and Ukraine war concentrate attention extensively on the human tragedy in Ukraine and its effects on the global economy. Academics and politicians have not given the war's potential to undermine some SDG's success adequate consideration. With an emphasis on Nigeria, the paper examines how the war has negatively impacted on SDGs Agenda to end poverty and hunger that have materialized on a worldwide scale as a direct effect of the crisis. With specific attention to SDGs 1 and 2, the study discovered that Nigeria is presently facing a sharp fall in food products and energy, a hike in the cost of purchasing commodities or inflation which compound the pains of the poor population of the country consequent upon Russia-Ukraine war, international sanctions that led to the disruption of global food supply chain. The dispute between Ukraine and Russia has exacerbated the food crisis and raised the poverty level of some Nigerians against the SDGs 2030 Agenda which pledged to “leave no one behind”, especially the vulnerable groupings. The war is having knock-on effects on education, the environment, food and nutrition, the ability of people to survive and by extension blocking chances of achieving the overall SDGs 2030 Agenda. Although adverse effects of the war are directly felt by Russians and Ukrainians, beyond the borders of the battlefield, Nigeria indirectly is experiencing far-reaching detrimental effects of the hostility on energy, industry growth, food and its economy in general. Nigeria, which typically imports a significant amount of its wheat from the Black Sea region, is currently facing severe consequences due to the ongoing Russia-Ukraine conflict.

Nigerian wheat millers are broadening their choices for wheat imports in reaction to the ongoing political tensions between Russia and Ukraine. The rise in global wheat prices caused by the prolonged conflict has led to a corresponding increase in expenditure on wheat imports. The scenario has had a detrimental effect on Nigeria's wheat supply value chain. The Foreign Agriculture Service (FAS) Lagos Post projects that wheat imports for MY 2022/23 would amount to 6 million metric tons (MMT), reflecting a 3 per cent increase. Simultaneously, the uprising and inundation in the northern region of the nation significantly affected the cultivation of maize and rice, respectively. The projected decline in corn output for MY2022/23 is forecast to be 5 percent, equivalent to 12.1 million metric tons (MMT). Similarly, rice production is expected to decrease by 7 per cent, amounting to 7.8 MMT (Nigeria: Grain and Feed Update, 2022). By implication, there has been a rise in the prices of wheat-based products and grains in the country.

The continuous weakening of the naira and the discontinuation of the fuel subsidy will not only result in a decline in consumption and imports, it will also diminish the buying ability of the people, and the preference for alternative goods. The rising cost of wheat has also resulted in the demand for wheat-based products (such as bread). The projected wheat consumption for the marketing year (MY) 2023/24 is expected to decline to 4.5 million metric tons (MMT), which is a 10 per cent fall from the official estimate provided by the USDA. Projections indicate that imports for the 2023/24 fiscal year would decline by 9 per cent, reaching a total of 4.8 million metric tons (MMT). In MY 2023/24, both corn production and consumption are projected to decline. Corn production is likely to fall by 7.3 per cent to 11.8 MMT, while corn consumption is anticipated to decrease by 4.6 per cent to 12.3 MMT (Nigeria: Grain and Feed Update, 2023). These declines might be attributed to ongoing insecurity and violence in the northern producing regions, as well as high production costs.



Nevertheless, rice consumption is projected to rise by around 4 per cent to reach 7.8 MMT. This can be attributed to the distribution of rice by the government at little or no cost to communities facing food insecurity, as well as the arrival of unauthorized rice imports.

The Nigerian government is striving to enhance local wheat and grain output due to the prevailing circumstances. However, the growth in local wheat production is mostly attributed to the Flour Millers Association of Nigeria (FMAN) signing a memorandum of understanding to procure wheat at a reasonable price (Donley, 2023). The goals are to reduce the dependence of the millers on imports and motivate the local producers. Nigeria depends on imports for 95% of its wheat supplies.

The Nigerian government have also been involved in providing high-yielding seed types, agrochemicals, and agricultural equipment to farmers to increase agricultural outputs. Nevertheless, the difficulties surpass the benefits. Security obstacles in the wheat-producing area impede farmers' ability to reach their crops. Furthermore, the combination of exorbitant production expenses, the prevalence of stem borer infestation, and an inadequate financial support system would have a detrimental impact on farm produce in the upcoming years if these challenges are not curbed.

## 6. Recommendation

The ongoing Russia-Ukraine crisis continues to generate substantial apprehension about its possible adverse effects on food security, both within the warring nations and on a global scale. Nigeria, being an import-dependent country continues to suffer the effects of the war, while the conflict pushes back the Sustainable Development Goals, especially goals 1 and 2 in this context. Therefore, Nigeria making progress in achieving SDGs 1 and 2 become an albatross. To prevent the manifestation of this set of consequences, it would be recommended that:

- i. In collaboration with the Flour Millers Association of Nigeria (FMAN), Rice Farmers Association of Nigeria (RIFAN), and other food farmers stakeholders, the government should strengthen the mission to promote and protect local production against import. Collaboration with the private sector that will cut down import supply of food in a bid to ensure food security should be the main drive of the government. The Russia-Ukraine war in the last 2 years has continued to subject Nigeria's daily staple to external shock due to its significant reliance on imports. Since the war started, the price of wheat in the international market pre-war has remained high, reaching a peak in 2022. A stronger collaboration with the local stakeholders of staple food in the country will change the narrative positively.
- ii. Continuous efforts must be made to improve security in warring regions. In Nigeria, there has been frequent clashes between herders and farming populations in several regions. These conflicts are mostly caused by disagreements over grazing areas. With the continuous military onslaught against bandits harbouring around forest areas, farmers in rural regions should be able to return to their farmland and, consequently, increase food production.
- iii. African countries should prioritize structural transformation and regional collaboration, reevaluate the

design of development financing and the global financial system, and keep up its continuous efforts to increase resilience.

- iv. A resilient, indigenous and sustainable agricultural/food system must be given elaborate attention by the Nigerian government and other concerned stakeholders. In order to achieve this, small-scale local farmers should be empowered financially and logistically through subsidized irrigation systems, adequate infrastructural facilities and a ready market for produced food items on a large scale. The government must sincerely embark on a policy that will ensure that Nigerians consume food items locally produced.
- v. The National Agricultural Development Fund's role is to offer financial support for the execution of agricultural policies and enhance agricultural institutions following national policies and strategies. In doing so, the fund will effectively eliminate any obstacles to prompt access to temporary funding in the sector for established stakeholders across the country who will genuinely contribute to the Renewed Hope Agenda's mission of achieving complete self-sufficiency in local food production and eventual surplus export.
- vi. There is a need to quicken the rollout of the new National Agricultural Technology and Innovation Policy (NATIP, 2022–2027), which focuses on promoting technologies to boost efficiency in agriculture, especially for wheat and some food grains. The NATIP makes use of tactics including quick mechanization, the creation of an Agricultural Growth Fund, a revitalized extension strategy, growth of livestock and fisheries, market development, and fortification of value chains.
- vii. The Nigerian policymakers must change unfair agricultural trade regulations. It is a positive development that land borders have just been reopened. By boosting the role of markets in regulating supply interruptions, such measures will lessen the susceptibility of Nigerian families to spikes in food prices. For Nigeria to participate and take the lead in the implementation of the African Continental Free Trade Area (AfCFTA) agreement, it is also essential to address trade inhibitions. For instance, it could be time to reevaluate import inhibitions on food items like rice and chicken meat given recent inflation. Several essential food commodities, like milk, sugar and maize are still on the list of items that are either forbidden or restricted or are not eligible for foreign exchange for imports.
- viii. Non-tariff obstacles to the trade in food, such as expensive transportation, burdensome paperwork, certification requirements, and standards, must be removed as soon as feasible. Nigeria must acquire independence and sovereignty to avert a dangerous degree of dependence on imports from foreign countries.

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## 9. SCHOOL ENVIRONMENT AND GIRLS' RETENTION IN UGANDA SECONDARY SCHOOLS

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### Abstract

*The report of the Uganda Bureau of Statistics (2021) implied a disparity between boys and girls in retention despite the Uganda government's policies to facilitate the achievement of the 5th Sustainable Development Goal. This study examined the influence of school environment-based factors on girls' retention in Sironko District, Uganda. Participants for the study were 162 girls randomly selected from three government-aided secondary schools in Sironko District. The data collection instrument was the School Environment and Girls' Retention Questionnaire (SEGRQ). The validity and reliability of SEGRQ were 0.82 and 0.87 respectively. Frequency counts and percentages were used to present the results. Based on government efforts, the assumption was that school environment-based factors would be positive predictors of girls' retention. Results were confirmatory, girls in this study were motivated to stay in school due to the availability of adequate physical facilities, counselling services and teaching and learning facilities. However, there was no clear-cut evidence on respondents' opinion of completion, while 50.7% indicated they were sure of completing school, 49.3% were not. This is probably an indication that more efforts need to be exerted on other predictors of girls' retention in schools. Most of the respondents, 79.9% and 77.8% were equally not satisfied with teachers' methods of teaching and the teacher-student relationship respectively. Hence, it was recommended that in addition to various government policies on gender equality, the government should enact policies that will enforce schooling to completion for girls and improve school supervision and monitoring. The Schools' Management Board should be committed to the inspection of schools, particularly teachers' activities to enhance effective service delivery.*

**Keywords:** School Environment, Girls' Retention, Uganda, Secondary Schools

### Introduction

The government of Uganda is at the frontline of facilitating the Education for All (EFA) and Sustainable Development Goals (SDGs), particularly the gender education equality goal. To this effect, several specific girls' educational policies such as the National Strategy for Girls Education (NSGE), Girls' Education Movement in Africa (GEM), Equity in the Classroom (EIC), Child-Friendly School programme, Focusing Resources for Effective School Health (FRESH), Universal Primary Education Policy, Environmental Health Policy and the Gender Desk in the Ministry of Education and Sports headquarters, were all enacted and implementation facilitated. The Environmental Health Policy (2005) focused on different interventions for men, women and children's specific needs, specifically considering women as the main users of water and sanitation facilities and the improvement of sanitation to women's dignity. The Universal Primary Education Policy (UPE) 1997 aimed at providing adequate facilities and resources that will enable every Uganda child to enter and remain in school until the primary cycle of education is complete. The NSGE policy of 2004 was reviewed in 2013 to bridge the gap between policy and practice and promote effective service delivery. The review was premised on the shortcomings of the previous 2004 policy. Hence, the 2013 policy was designed to be a strategic tool for the identification, implementation and coordination of interventions to adequately promote girls' education in Uganda (UNICEF, 2014). Unfortunately, despite all these significant efforts, the transition rate as well as the

completion rate for boys in the secondary school system stands higher than that of girls.

Enormous success has been recorded in the Uganda education system, especially at the primary level. There is an equal status of 99% enrolment and 51% completion for both boys and girls in primary school. The completion rate for girls in Uganda primary schools was 12% and boys 7% but the transition rate to secondary for boys is 10% and girls 7%. (Education Policy Data Centre, 2018; Uganda Bureau of Statistics, 2021). The Uganda Bureau of Statistics (2021) recorded an increase in enrolment for girls at the secondary school level, but disparity exists at transition and completion, which suggests a decrease in retention. Transition rate to secondary schools for boys for five years; 2013- 2017 was between 37 % and 28.4% and for girls between 27% to 21%. The percentage of secondary school-age boys who were out of school was 21% and 30% for girls. The completion rate for boys in secondary over the same period was between 36.7% and 36.2% while girls are between 33.8% and 33.5%. Transition to secondary school remains a challenge for the girl child compared to the boy, with a relatively significant completion rate difference. The expectation is that there will be no disparity in the schooling of boys and girls at all levels in Uganda, based on the various support programmes and policies enacted to facilitate gender equality in education.

Different mediating factors of transition and completion for girls in schools, such as poverty, social and cultural factors, school environment, family, internal attributes of the girl, and gender violence, among other factors have been highlighted by different scholars (Byaruhanga, 2019; Mikisa, 2019; Mackatiani *et al.*, 2022; Kayindu *et al.*, 2022; UNICEF, 2014; UWEZO, 2016; Sulaiman and Sanusi 2015; Sulaiman *et al.* 2017). Notwithstanding, the Uganda Ministry of Education and Sports (MoES) identified four key factors as the challenges of achieving equality in education between boys and girls in Uganda sequel to the review of the NSGE 2004 policy, which, was replaced with the 2013 NSGE. The challenges identified are (1) Gender-based violence and abuse of power by men, which put girls at risk at home, school, and community. (2) Teenage pregnancy, which results in girls dropping out of school, and the need for reintegration, which will adopt the Pader Girls Academy (PGA) child mothers' rehabilitation model. (3) Family practices, such as gender division of labour, forced marriage and the general value attached to girls' education, which affect girls' access to education. (4) The school environment, which includes physical facilities and the social environment. The social environment covers all issues of human relationships within and outside the classroom, including guidance and counselling services and co-curricular activities (UNICEF, 2014). The question here is, have the 2013 NSGE interventions been achieved? This presents the major concern of this paper and the choice of the school environment as a yardstick to examine the influence of different intervention policies on girls' schooling.

The choice of the school environment is its ability to provide the required interventions, which would facilitate achievement of equal education for both boys and girls. The school environment influences students' behaviour and impacts other factors that affect students. (Adzamba 2016; Orira, 2016; Odeh *et al.* 2015; UNICEF 2014; Sulaiman *et al.* 2017). The school environment, especially for the girl child, involves the physical, psychological, social, cultural, and learning environment (Adzamba, 2016). However, for this study, the sociocultural aspect of the school environment is discussed along with the school's learning environment. The



physical environment of the school is characterised by its facilities: adequate and well-equipped classrooms, size of the classroom, ventilation, sitting arrangement, availability of tables, chairs, whiteboards, and shelves, books, educational devices, school-based health supports for emergency health issues and hygienic toilet facilities with changing rooms for the girls separate from those of boys. Usually, the availability of toilet facilities with running water is a retention factor for the girl child. She always needs to change her sanitary pad and sometimes clean up (Kalembe and Emojong, 2020). The efficacy of adequate schools' physical environment in promoting performance, retention and completion has been emphasised in different studies (Kalembe and Emojong, 2020; Mackatiani *et al.*, 2022). One of the key intervention programmes of the MoES is physical facilities, including the availability of girls' friendly toilet facilities.

The psychological environment of the school is defined by its philosophy and practices, such as the rules and regulations of the school, methods of discipline, guidance and counselling services, and attitude of the teachers and administrators towards students, particularly the girl child. The psychological environment of the school impacts on the behaviour and personality of students. The guidance and counselling services are expected to assist in shaping the understanding and behaviours of students. The essence of guidance and counselling in schools is to facilitate appropriate decision-making and worthwhile adjustment (Auf, & Arinaitwe, 2022; Sulaiman, 2015; UNICEF, 2014). Students generally, and girls specifically, are guided to deal with and overcome all challenges that may prevent transition and completion. According to Sulaiman (2015; 2021), counselling adequately prepares and equips young ones, girls in particular, to become the next generation of parents, workers, leaders and citizens. The well-being of the client is crucial to the counsellor, the goal is to constantly prevent potential problems from emerging, motivate behavioural change, teach appropriate problem-solving skills and facilitate worthwhile development. Although guidance and counselling services are not provided by professionals in most schools in Uganda (Auf, & Arinaitwe, 2022), guidance and counselling remain an essential service of the Ministry of Education and Sports and many schools' programmes. Guidance and counselling services were identified as an important intervention tool for the achievement of equal educational attainment for both girls and boys in Uganda (UNICEF, 2014).

The schools' learning environment involves the teaching and learning process, effective teaching and learning are key factors of transition and completion for girls (Adzongo & Olaitan 2019; Munna & Kalam, 2021; Marshall, 2016; Mackatiani *et al.*, 2022; Namukwaya, & Kibirige, 2014; Orira, 2016). The effectiveness of teaching is judged by the teacher's ability to use various teaching and learning techniques to achieve meaningful learning. The performance of learners in a particular classroom can be attributed to a teacher's ability to manage and control the classroom during instruction (Adzongo and Olaitan, 2019). A girl-friendly effective teaching and learning classroom creates conditions that facilitate learning. The teacher motivates learning by developing a good student-teacher relationship, with the use of different skills, knowledge and attitudes, which inspire learners to enjoy all the activities within and outside the classroom. Adzongo and Olaitan (2019) assert that teaching entails active involvement and participation by students, students must be actively involved in the teaching and learning processes with teachers putting into consideration the peculiarity of each learner. Teachers who are enthusiastic about encouraging the participation of girls in the classroom encouraged their completion

rate. Mackatiani *et al.* (2022) reported that teacher's attitude towards girls in the classroom was crucial for retention. Orira (2016) added that the variables that measure effective classroom learning environments as perceived by students predict their attitude towards schooling and performance.

Further, the school learning environment includes the social and cultural environment, which are reflected in the various personal and interpersonal relationships within the school. The students' interactions with their peers, teachers, and administrators are all components of the learning process for students, particularly the girl child. The teacher is a role model who trains in learning and character. The school as an agent of socialisation teaches appropriate norms, values and cultural practices; the school dissociate itself from prejudices, educates both boys and girls, and specifically empowers the girl child. The co-curricular activities of the school teach teamwork, self-sacrifice, loyalty and different social skills, which are usually part of the school guidance and counselling programmes (Sulaiman *et al.* 2017).

### **The Problem**

Premised on the Uganda government's efforts in facilitating the achievement of the 5th Sustainable Development Goal of gender equality through the enactment of different policies and programmes, the outcomes remained insignificant. Unfortunately, the Uganda Bureau of Statistics (2021) still recorded disparity in the education of boys and girls in Uganda. The transition rate to secondary schools for girls, 21% is lower than that of boys, 28.4%, the percentage out of schoolgirls, 21% is also lower than that of boys 30% and the completion rate for boys in secondary over five years (2013- 2017) is between 36.7% and 36.2% while that of girls is between 33.8% and 33.5%. In addition, the Ministry of Education and Sports, realising the challenges of the policies took a drastic step of reviewing one of the policies NSGE 2004 in 2013 to bridge the gap between policy and practice and provide appropriate interventions that will facilitate the achievement of the national goal of equal education opportunities. NSGE 2013 policy interventions were to run for 5 years (2015 – 2019). The expectation is that the interventions would have corrected the identified challenges, and the goal of the policies would have been achieved. Hence the need for the study to examine the influence of school environment on girls' retention. As earlier noted, the choice of the school environment is its ability to provide the required interventions to facilitate the achievement of equal education for both boys and girls and the decision to examine retention is based on the gap between boys and girls in transition and dropout rate (Uganda Bureau of Statistics, 2021).

### **Questions**

The following questions guided the study:

1. What is the influence of physical facilities on girls' retention in schools?
2. What is the influence of guidance and counselling on girls' retention in schools?
3. What is the influence of the learning environment on girls' retention in schools?

### **Methods**

#### *Research Design*

A cross-sectional survey research design was employed to gather information from respondents on the influence

of school environment on girls' retention across different government-aided secondary schools in Sironko District, Uganda.

### *Sample*

The sample for the study consists of 162 randomly selected girls from three government-aided secondary schools in Sironko District, Uganda. In each selected school, 54 girls in the upper class; seniors 4 to 6 were randomly selected, and 18 girls from each level. The selection of girls in the upper class was to tap into their years of experience in the school.

### *Instrument*

A self-developed checklist tagged School Environment and Girls' Retention Questionnaire (SEGRQ) was used as the instrument for the study. SEGRQ was divided into four sections; students were to tick each item that best motivated their stay in school in each section. Section A consisted of questions on the physical facility, questions in Section B were on guidance and counselling, Section C question items were used to elicit information on teaching and learning environment and retention, and Section D questions were used to tap information on retention. A tick on any statement in each section is a "Yes, the statement would make me stay in school till completion" while those not ticked are a "No, the statement will discourage my staying in school". SEGRQ was presented to experts in the field of study for content and face validity, then, the Content Validity Index (CVI) was computed based on the corrections. A validity of 0.82 was established for SEGRQ. The reliability of SEGRQ was generated using the test-retest reliability measure. A sample of respondents from the population of the study was presented with the SEGRQ twice for two weeks and their responses were correlated. The result yielded a reliability coefficient score of 0.87, which confirmed the reliability of SEGRQ.

### *Methods of Data Analysis*

Data was analysed and presented with simple frequency counts and percentages.

## **Results**

Nine question items on SEGRQ were used to elicit information on the first research question, which examined the influence of physical facilities on girls' school retention. Respondents were requested to identify facilities, which motivate their staying in the school. Results presented in Table 1, show that there were adequate physical facilities in the schools. Responses to all the question items have a percentage of 53.1% and above. There is an indication that the classrooms are relatively adequate 53.1% but well-ventilated 91.5%. There are sufficient learning materials at 72.8% and clean toilets at 80.9% with changing rooms at 80.2%, which motivates girls to remain in school.

**Table 1: Responses on Physical Facilities and Girls' Retention**

Items	No	Yes
The school has a sickbay with a qualified nurse and it is adequately equipped	71(43.8)	91(56.2)
There are enough desks, chairs and tables to sit and write	44(27.2)	118(72.8)
There is access to safe clean water and hand-washing facilities	30(18.6)	132(81.5)
The school has separate toilets for boys and for girls	32(19.8)	130(80.2)
The dormitories for girls are clean, spacious and adequate	23(14.2)	139(85.8)
There is a changing room in the girls' toilet.	40(27.4)	122(75.3)
The classrooms are not crowded	76(46.9)	86(53.1)
The classrooms have enough windows and are well-ventilated	8(4.9)	154(91.5)
The school' toilets are always kept clean	31(19.1)	131(80.9)

The results presented in Table 2 are the responses of participants on the influence of guidance and counselling on girls' retention.

**Table 2: Responses on Guidance and Counselling and Girls' Retention**

Items	No	Yes
There is a functional guidance and counselling department in the school	38(23.5)	124(76.5)
The counsellors provide adequate counselling services	41(25.3)	121(74.7)
The school counsellor always organises career talks for students	21(13)	141(87)
The counsellor has weekly counselling sessions for students	58(35.8)	104(64.2)
The counsellor usually invites parents for discussion on students progress and performance.	75(46.3)	87(53.7)
The school counsellor usually follows up on students with specific problems.	47(29)	115(71)

Counselling activities appeared to be a key motivating factor for girls' retention, 74.7%. Respondents were motivated to stay in school because there were functional counselling departments 76.5% with different counselling programmes, such as the career week 87%, weekly counselling 64.2% and individualised counselling 71%.

The results presented in Table 3 show participants' responses on the influence of the learning environment on girls' retention. Unlike the previous two school environment factors, the learning environment is not motivational despite the availability of qualified teachers. Most respondents did not find any motivational activity in the classroom 91.5%. Teachers do not give individualised instruction 83.3%, no good rapport 77.8%, minimal use of instructional material 84.6% and lack of varied support for girls to learn 75.9%.

**Table 3: Responses on Learning Environment and Girls' Retention**

Items	No	Yes
The school has qualified teachers for all subjects	19(11.7)	143(88.3)
The teachers provide varied opportunities to aid students' success	123(75.9)	39(24.1)
There is a good rapport between the teacher and the students in the class	126(77.8)	36(22.2)
The teacher introduces a variety of activities that aid learning	154(91.5)	8(4.9)
Teachers use different instructional materials for teaching	137(84.6)	25(15.4)
Teacher gives attention to individual students in class	135(83.3)	27(16.7)

The results presented in Table 4 are the responses of participants on retention. Participants were asked to identify issues on the list concerning girls' retention. The results show an increase in girls' enrolment 81.5%, completion 97.5%, an increase in the number of girls compared to boys 85.8%, increase in number of girls returning to school each term 64.2%, and the decision to complete schooling 50.6%, which is relatively low and marginal.

**Table 4: Responses on Girls' Retention**

Items	No	Yes
The number of girls who remain in school after enrolling in S.1 has increased	30(18.5)	132(81.5)
The number of girls completing their studies in the school has increased	4(2.5)	158(97.5)
The number of girls in the school is more than that of the boys	23(14.2)	139(85.8)
Girls in the school are determined to complete their education	82(50.6)	80(49.4)
In my class, all girls return to school at the beginning of every term	58(35.8)	104(64.2)

### Discussion And Conclusion

The study aimed to examine the influence of school environment-based factors on the retention of girls in schools. The assumption as earlier stated was that with the different policies and interventions from the government, MoES and different non-governmental organisations, equality in education between girls and boys would have been achieved, especially with NSGE interventions. Expectedly, the results of this study showed that school environment-based factors are good predictors of girls' retention. Although, completion relatively remained a challenge for girls in this study with an average score of 50.6%. However, the 2013 NSGE interventions have been achieved. The findings of this study on the influence of physical facilities and girls' retention is a confirmation of NSGE 2013 achievement, the provision of adequate physical facilities was a factor of the school environment identified. Precisely, as found in this study, the provision of girl-friendly clean toilets was one of the 4th focused areas of the intervention (UNICEF, 2014). Results showed that there were adequate physical facilities in the schools. The classrooms were well-ventilated with learning materials and clean toilets with changing rooms. Kalembe and Emojong (2020) already assert that the availability of toilet facilities with running water is a retention factor for the girl child because she always needs to change her sanitary pad and sometimes clean up. The efficacy of an adequate physical environment in promoting performance, retention and

completion in schools was emphasised in different studies (Kalembe and Emojong, 2020; Mackatiani *et al.*, 2022).

The findings of this study on guidance and counselling and girls' retention corroborate the positions of Auf, and Arinaitwe (2022), Sulaiman *et al.* (2015; 2017), and UNICEF (2014) who stated that the essence of guidance and counselling in schools is to facilitate appropriate decision-making and worthwhile adjustment. Guidance and counselling services are key factors motivating girls' retention in schools as in the result of this study. Respondents were encouraged to stay in school because there were functional counselling departments with different counselling programmes and more importantly individualised counselling interventions. Hence, this affirms Sulaiman's (2015) position that counselling effectively prepares and equips young girls with developmental skills in behavioural change and problem-solving.

Surprisingly, the learning environment in this study was not girl-friendly and effective despite the efforts of the government and MoES. Nevertheless, the presence of highly qualified teachers confirmed the level of commitment of the government and MoES efforts to ensure implementation. Unfortunately, teacher's attitude towards girls in the classroom is crucial for retention (Orira, 2016). The teacher inspires learning by developing a good student-teacher relationship, with the use of different skills, knowledge and attitudes, which motivates learners to enjoy all the activities within and outside the classroom. In addition, Mackatiani *et al.* (2022) stated that students predict their attitude towards schooling based on their perception of the classroom learning environment, which explains the overwhelming 91.5% lack of activities in classroom response. Adzongo and Olaitan (2019) aver that effective teaching and learning entails active involvement and participation by students, students must be actively involved in the teaching and learning processes with teachers taking into consideration the peculiarities of each learner.

### **Recommendations**

In addition to various government policies on gender equality, the government should enact policies that will enforce schooling to completion for girls and improve school supervision and monitoring.

The government should also develop enlightenment programmes through the media, the school, and the community leaders to educate the populace on the importance of not just educating the girl child but also ensuring that she remains in school till completion. Also, the government may have to build more schools, the 53.1% score for crowded classrooms is an average score, which suggests relative inadequacies.

Teachers in this study were not committed to duty. The Schools' Management Board and Director of Schools should be more committed and responsive to monitoring and inspection of schools and, more importantly, the inspection of teachers' activities to enhance effective service delivery.

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## 10. Sustainable Performance and Capacity Assessment Indicators for River Basin Organisations in Nigeria: Case Study of Ogun-Osun River Basin Development Authority

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### ABSTRACT

Water is an indispensable constituent that sustains life. Due to increased water demand and competition among the various users, basin organisations were established to manage water resources. Regardless of the significant presence of River Basin Organisations (RBOs) for development purposes in Nigeria, the problems for which the RBOs were established remain unresolved. Purposive sampling technique and interviews were adopted to select participants from the community and interviews were conducted for respondents from Ogun Oshun River Basin Development Authority (OORBDA), the targeted government officials, and members of academia. Although performance assessments have been done in water allocation, water quality, and basin management among others, this study reviewed six categories out of ten (10) qualitative indicators developed by Hooper based on data availability and time limit of the research. The categories are coordinated decision-making, responsive decision-making, organizational design training, and capacity building, information /research, and private and public sector roles as strong indicators for effective management of the RBO. The challenges observed include but are not limited to water scarcity, pollution, and sedimentation, however, little has been done to assess the performance of RBOs in response to flood prevention and power generation. The indicators that contributed to poor performance are the use of multiple agencies, poor basin planning, inadequate national water law/policy, ineffectiveness of rivers basin organization to prevent flood through risk assessment, lack of efficient water management program, poor institutional arrangement, stakeholder participation, and lack of capacity building in flood prevention and power generation. The outcome of the performance indicators from the study shows that the OORBDA has not been able to serve the purpose it was created. To attain one of the goals of sustainable development, especially goal 3, the government needs to review the objectives of OORBDA and improve the organization's structure for efficiency.

**Keywords: Water resources, River Basin, Flooding, Ineffective management**

## Introduction

Water is an indispensable constituent that sustains life. Due to increased water demand and competition among the various users, basin organisations were established to manage water resources at the basin level. River basin organisations (RBOs) are seen as an important instrument for meeting the objective of managing the water resources in the riparian environment. It is considered a vehicle for implementing integrated river basin management at the basin level (Hooper, 2006). The organisations are to oversee various activities relating to managing water resources. Various researchers have tried classifying and defining them in different ways (Hooper 2006; Mody, 2004). The areas of coverage of RBOs are vast and at times overlap with other agencies such as ministries of works, agriculture, water resources, and environment among others. Some countries set these bodies as independent entities and others make their operations fall under any ministries. However, the types, roles, and responsibilities of these organisations in various countries differ and range from irrigation, water quantity and quality, agriculture, hydropower, and dam construction. The low performance (<http://awdrop.org/uploads/3/1/7/8/3178681/national-water-policy.pdf>) (Biswas, 2008) has given rise to the need for assessment at different stages of development for the different functions in a multipurpose basin using the generic key performance indicators developed by Hooper (2011). River basins as defined in Article II of the 1966 Helsinki Rules and as a conglomerate set of water courses as defined in the Water Courses Convention Article 2a of 1997 ([http://legal.un.org/ilc/texts/instruments/english/conventions/8\\_3\\_1997.pdf](http://legal.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf)) are not limited to surface waters but also include the physical land area and underground waters flowing into a common terminus ([http://www.internationalwaterlaw.org/documents/intldocs/Helsinki\\_Rules\\_with\\_comments.pdf](http://www.internationalwaterlaw.org/documents/intldocs/Helsinki_Rules_with_comments.pdf)). Understanding the river basin is essential to help frame the role and scope of the basin organisations. The Helsinki definition makes it apparent that the coverage of the River Basin organisation has widened. The consequence is that water management comprises a variety of uses, especially in multi-purpose river basins. Based on the geographical area and other factors, basin organisations face different challenges, including water scarcity, pollution, sedimentation, and flooding (Jaspers, 2003). The scope implies that most activities of men having to do with natural water bodies are under basin management. Moreover, the scope of the river basin organisation is also governed by the most pressing needs of the stakeholders. These scopes may change as the needs change over time. It is surprising to recognize that despite the numerous existences of river basin organizations for development purposes in many countries, the problems for which they are established remain unresolved. (Dinar et al, 2007). Furthermore, flooding, resulting from a combination of factors is fast becoming a major challenge facing Nigeria (Djordjevic, 2011). The research study aims to identify the relevant sub-indicators that would be useful to measure the performance of river basin organisations dealing with flood control, in particular, dam-related floods. Also, come up with a recommendation that can be used to formulate policies or plans for effective management of rivers in the water sector.

Disasters occur in many countries of the world (Van Westen, 2000) that could either be a result of human activities or natural. The latter resulted in more loss of lives and properties in developing countries than the developed countries with an estimated financial loss of about US\$400 million annually (Gupta et al, 2003). Examples of natural disasters include among other cyclones, earthquakes, and volcanic eruptions. Flooding is the most widespread of disasters that occur naturally (Etuonovbe, 2011; Gupta *et al*, 2003). According to (Olajuyigbe *et al*,

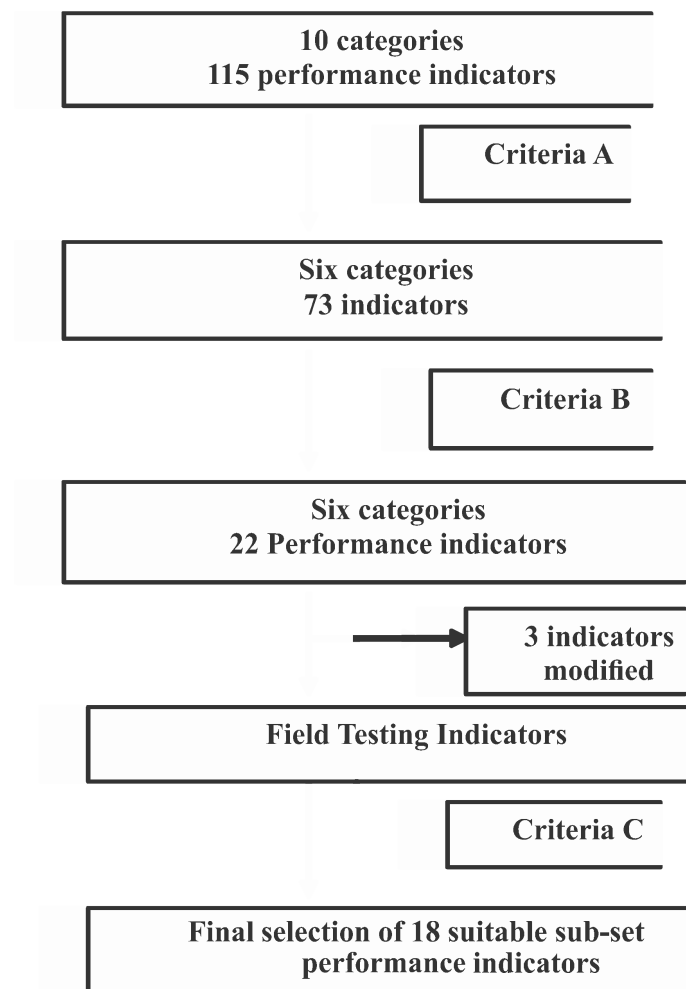
2012; Barredo, 2007) flooding is seen as the short term of a land surface covered by water that is usually not covered by water. It regularly claims more than 20,000 lives and approximately adversely affects 75 million people per year worldwide (Smith, 1996 cited in Adejuwon and Aina 2014). Universally, floods have posed a great threat to people's lives and property. Flooding is about one-third of damage from natural disasters (Askew, 1999 cited in *ibid*). It is also ranked as the second major disaster behind tornadoes with the United States recording damages totalling \$8.41 billion in 2011 (Adhikari *et al*, 2010). Examples of countries prone to and affected by floods are the United States, India, China, and Nigeria among others (Etuonovbe, 2011; Adhikari *et al*, 2010).

Furthermore, research studies also revealed an estimated number of deaths to be 100,000 people per year. Those affected are about 140 million people annually (Adhikari *et al*, 2010; Jonkman, 2005). Other impacts of floods are loss of aesthetic and aquatic lives, and cultural as well as socio-economic human well-being (Jonkman, 2005). However, flooding is a common, occurring disaster in Nigeria. It is not a contemporary occurrence in the country, and the damage propensity is occasionally colossal. Many states in Nigeria have also experienced several flood disasters that have claimed lives and properties worth millions of dollars (Adejuwon and Aina, 2014; Etuonovbe, 2011). There are various types of flooding, including urban and coastal among others. However, the focus of the study is dam-related river flooding (Adejuwon and Aina, 2014; Olajuyigbe *et al*, 2012; Barredo, 2007; Jonkman, 2005). Recently, in the year 2024 floods in parts of Kogi State have displaced tens of thousands of people from their homes in affected areas including Ibaji, Lokoja, Kogi and Bassa, according to the Nigerian Red Cross Society (NRCS). This follows spot assessments of the flood situation in the State. While most affected people have relocated to higher ground in neighbouring areas including Idah and Lokoja LGAs, others have moved to other states for safety such as Anambra, Adamawa, Benue, Borno Enugu, Delta, and Nasarawa. Some have, however, opted to remain behind to protect what is left of their crops/potential harvests. This created a financial burden on the state and federal government leading to more creation of Internally Displaced People (IDP) centres/camps all over the states especially in the flooded states.

Hence, there is a need to fill the gap by identifying and applying suitable indicators to evaluate river basin organisations dealing with the prevention of floods in a developing country with high rainfall. The study aims to identify the performance sub-indicators that would be suitable for assessing the performance of river basin organisations dealing with the specific function of flood prevention (Hooper 2006). Also, come up with recommendations that could be useful to improve the performance of river basin organisations dealing with flood prevention. It should be noted that an indicator is a tool for assessing performance in the management of water which is referred to as water governance (Hooper 2006; Makin *et al*, 2004).

Given the objective of the research study, the key performance indicators developed by Hooper 2006 were considered. It is imperative to put to test these indicators to ascertain the most suitable for RBO flood prevention. In this study, 23 indicators were identified but clustered into six categories namely: (1) Coordinated decision-making, which focuses on the existence of high-level, cross-sectoral policy links between natural resources management and other sectors (water users) (2) Responsive decision-making that emphasises evidence of dialogue to be used as an instrument of decision-making on preferred management options – as in open meetings, tribunals, forums (3) Organizational design that seeks evidence of institutional arrangements for basin

management which specify the roles and responsibilities of different entities and stakeholders, and the existence of water law and policies. Other categories include (4) Training and capacity building which describes the mechanism of building human capacity related to the administrative, economic and political setting within the country of operation (5) Information and research that considers interagency cooperation and accessibility of information by relevant stakeholders is a necessity in flood control. The last category focuses on Private and public sector roles which, suggests a strong community awareness and participation processes to enhance greater ownership of basin-scale plans of action as a strong indicator for effective management of the RBO. Not all the selected indicators are expected to be applicable for the assessment of the RBO in flood prevention in the study area. Understanding the scope and performance of river basin organizations with flood control as one of their roles would enormously help to understand the causes of failure. This study assessed how RBOs in Nigeria function in practice and what can be done to improve the performance of RBOs in Nigeria in the effective prevention of floods. Of great importance is the role this report may have as a reference for policymakers to investigate the causes of failure and see how to establish an improved policy in the future towards improved integrated water resources management at the basin level. The study identified suitable performance sub-indicators that could be applied to evaluating river basin organisations dealing with flood control in Ogun-Osun RBO, Nigeria (Figure 1).



**Figure 1: Schematic diagram of the selection procedure**

## Historical Perspective of RBOs

Human societies have been formed very close to the existence of natural waters, especially rivers because of the inevitability of water to the existence of man. To ensure that water is available for drinking, washing, and bathing, every society, even before civilization had devised means of putting under control, the use of this essential commodity using their natural intelligence (Dellapenna and Gupta, 2009). The manner of taking control, of the use of water, has been greatly affected by a whole maggot of changes that have characterised human societies which have brought the need to see the issue of water management as the societal norm. The Society therefore considered it proper to have organisation(s) that will be taking a total look at and paying attention to the issue of water control seeing to flood and flood-related matters, drought, and all that concerns water as an essential aspect of life. The birth of river basin organisations (RBOs) was, for this reason, necessitated to ensure that bodies exist to take charge of the responsibilities of providing water for society and allied duties (<http://www.rivernet.org/general/docs/making-WFD-work-February05.pdf>).

Furthermore, for rivers that are claimable by two or more countries, formal agreements tend to exist on how the water could be used by those who share it. This may come in the form of commissions on rivers as could be seen in Rhine (Jaspers and Gupta 2014) such arrangement, as in the case of Rhine was mostly concerned with matters of navigation and the best way to use water for the general benefits of mankind. Organisations such as the International Joint Commission for US and Canada which later became the International Boundary and Water.

The commission was involved. Argentina, Bolivia, Brazil, Paraguay, and Uruguay benefited from treaties on water management at the international level. Egypt and Sudan were beneficiaries as well. More countries in Africa also formed commissions to see to the issue of water allocation and general management. They include the Niger River Commission and the Zambezi River Course Commission. In 1992, Kazakhstan, the Kyrgyz Republic Tajikistan, Turkmenistan, Uzbekistan & Afghanistan were involved in treaties to form Interstate Coordination Water Commission (Jaspers and Gupta, 2014). One can also trace the growth of RBOs to the days of the Industrial Revolution which made waterways become a transportation route (Hooper, 2005).

Considering the global trends in water management via RBOs, especially in irrigation, dam construction, and flood control, the Federal Government of Nigeria, via decrees 25 and 31 of 1977 respectively established twelve River Basin Development Authorities including Ogun Oshun River Basin Development Authority (OORBDA). Over time, there have been a series of amendments to the original operational responsibilities of the Authority occasioned by the enactment of Decree 35 and 25 of 1987 and 1988 respectively. The OORBDA, as presently constituted operates as a parastatal of the Federal Ministry of Water Resources. OORBDA' v the potential of the area it covered in respect of water resources. This is to boost the individual, agricultural and domestic fortune of the people and for effective flood control. It must be said that the kind of emphasis placed on any of the purposes above over the years has depended on the policy direction of the federal government through the supervising ministry (<http://www.oorbda.com.ng/home.php>).

## Functions of River Basin Organisation (RBO)

River basin organisations (RBOs) are umbrella organisations for basin-wide (Wingqvist and Nilsson, 2015) water resources management. However, the establishment of RBOs, either formally or informally was to enable the society to do what is needful to its people in the areas of provision of drinking waters, protection of coastal

boundaries, and prevention of flood. In the pursuance of these objectives, RBOs have been billed to carry out specific functions that may vary depending on the needs of the people and their environment concerning river water management. The roles and responsibilities that are expected from these basin organisations are dictated by the rationale behind their establishment and vary from country to country (GWP, 2009). Furthermore, these basin organisations perform several functions, which include planning and policy development; and analysing stakeholder needs related to natural resource management. Other functions are identifying goals and guidelines for sub-catchment, development of cost-sharing programmes, coordination and monitoring of programmes related to the management of natural resources<sup>10</sup>. Makin and colleagues noted that, in most countries, river basin management organisations' structure and functions continue to evolve, and, in some cases, integrated management of river basins is replacing sector-based management while water laws and regulations are being developed and implemented (Makin *et al.*, 2004). Moreover, in most cases, the legal instruments that establish RBOs usually specify, in clear terms, the functions that they should perform. These laws, of course, are not the same in all countries of the world. In Namibia, for example, river basin committees were established under the Water Act 24 of 2004 as coordinating units. The roles of the basin committees were anchored on improving stakeholder participation, efficiency in managing resources and coordinated planning among others. Also, the Piracicaba – Capivari Jundai River Basin State Committee was established via the Sao Paulo State Water Law 7663 of 1991 in Brazil.

The role of the committee includes management plan; approval of budget allocation among the various water resources management programmes and to promote cooperation among the water users (Nashipili 2008). Moreover, in Nigeria, river basin authorities were established according to Salau (1986) via decrees 32 and 33 of 1973 and other decrees in 1976. The basin organisations operate under the same conditions because they have one supervisory ministry. The functions include the widespread development of both ground and surface water resources for multi-use; maintenance and construction of dams, drainage systems, and dykes; development and maintenance of up-to-date detailed water resources master plan and undertaking plans for the control of erosion and floods among others (Olomola *et al.*, 2014).

From ages past, RBOs evolved to take charge and take care of society's needs around the provision of drinking water, the use of rivers for water transportation, and more importantly, the control and prevention of flood incidents. Therefore, one can affirm that the functions of RBOs have been naturally defined by the existence of rivers as the gift of nature. Thus, peculiarities in the control and management of rivers often dictate the function that RBOs perform. In addition to this and as expected too, treaties and legal provisions that brought about the establishment of the RBOs state the functions that these organisations should perform. The laws are not the same in different countries hence the functions are also changing (Makin *et al.*, 2004). Furthermore, the challenges faced by basin organisations differ from country to country. It ranges from pollution, water scarcity and flooding, the focus of this study.

## **Methodology**

### **Study Area**

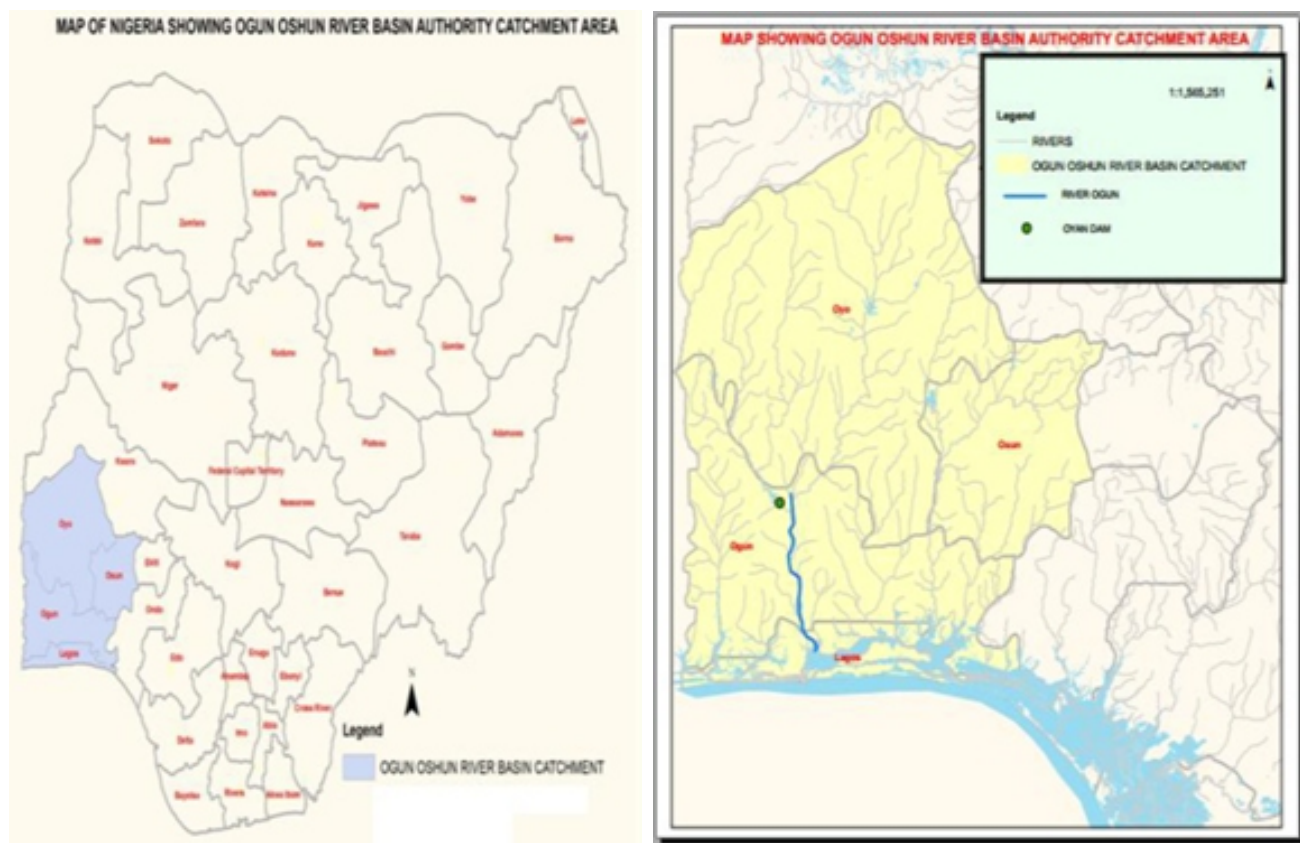
The choice of the Ogun-Oshun River Basin Development Authority was influenced by the following factors.



Familiarity and language, relevance to research study, knowledge acquisition in management of water resources at basin level, and contribution to policy development towards effective management of water at basin scale and reduction of the incessant flooding. Additionally, the choice of OORBDA was necessitated by the need for this study to identify, locate, and establish in practical terms, those indicators that are key to the performance and capacity of the operations of the organisation in dealing with flood prevention.

Ogun-Oshun River Basin Development Authority (OORBDA), a river basin organisation in southwest Nigeria was established for the effective management of water resources at the basin level. The organisation is a parastatal of the Federal Ministry of Water Resources and Rural Development. Based on Hooper (2006) basin organisation characterisation, the Ogun-Oshun River Basin Development Authority, Nigeria falls under the commission type of basin organisation characterisation. The river basin area stretches across the four southwestern states of Lagos, Ogun, Oyo, and Osun and covers approximately a land area of 66,264 km<sup>2</sup>. The basin was named after the Ogun-Oshun Rivers lies between latitudes 6°30' - 8°20' N and longitudes 3°23' - 5°10' E (Ewemoje and Ewemoje, 2011). Mainly, the study area experiences two types of seasons, the rain season between April and October while the dry season runs from November to March (Idowu et al, 2012; Ewemoje and Ewemooje, 2011; Oyegoke and Sojobi, 2012; Jaji *et al*, 2007). The Headquarters of OORBDA is in the capital of Ogun State, Abeokuta which has an annual rainfall of 1205mm and is situated within the vegetative zone of moist semi-deciduous forests and wooded savanna (Idowu *et al*, 2012). Furthermore, three main tributaries Ogun, Oshun, and Yewa Rivers, while Ikere Gorge Dam is directly on the Ogun River, Oyan Dam on the other hand is on the Oyan River; they are the two major dams within the basin which are also multipurpose in use. Oyan Dam is the only one in the basin responsible for regulating the water flow in the Ogun River basin. Commissioned in 1983, Oyan Dam has turned out to be a mixed blessing for the people in the riverbank areas. Jaji *et al*, (2007) noted that as a storage dam, the annual flooding of Lagos and Ogun State residents experienced perpetually caused by water released from the dam during overflow which had made the Dam very dysfunctional having failed to serve the purpose it was built.

Moreover, Oyan Dam is located on lat. 7°14'N, long. 3°13'E close to Abeokuta, Ogun state capital city. The surface area river covers about 4,000 hectares with a catchment area of 9000km<sup>2</sup>. The dam has a height of 30.4m, crest length of 1044m and storage capacity of 270 million cubic metres. The dam was designed for two main reasons: to support the 3000 hectares of irrigation project at Lower Ogun basin (not functional at the time of visit) and raw water supply to Abeokuta and Lagos. Also, installed were three thousand (3000) megawatt turbines that had not been utilised (Ofoefie and Asaolu, 1997) at the time of the visit to the dam site (Figure 2).



**Figure 2: Map of Nigeria showing Ogun Oshun River Basin Authority Area (Four States covered by OORBDA) and OORBDA Basin Map showing the study area.**

### Sampling Techniques

The qualitative ex-post-fact nature of the study has made it imperative to use purposive sampling. According to O'Leary (2013), purposive sampling includes the choice of the strategic sample with a precise purpose in mind and expands data by exploring the limitations or boundaries of circumstances or Key respondents that will be of assistance in obtaining essential data that are appropriate to the study. A purposive sampling technique was adopted for the focus group discussion to select participants from the community because of the already established and recognised community development associations consisting of representative/s per property in each community in the Nigerian context. On the other hand, interviews were conducted with respondents from the Ogun Oshun River Basin Development Authority and the targeted government officials as well as the academics. The merit of using this method unlike the random technique is that one can be sure that the respondents will have useful information that will benefit the study. It should be noted that more than fifty communities exist along the bank of the river. The choice of twelve communities under the auspices of community development associations grouped into four became expedient because the effects of each occurrence of a flood incident affect some communities more than others. The communities were those mostly affected by flooding occasioned by the release of water from Oyan Dam in year 2010 and 2013. The choice of the communities was based on accessibility and the high tendency to obtain detailed and objective information.

## Data Collection

The methods of acquiring data for the study are Interviews and focus groups besides reviewing text and literature. Interview and focus group methods were adopted because they offer the opportunity to play an active role with more interest in the intricacy of the data instead of the comprehensiveness. Furthermore, interviews with twenty (20) respondents in different capacities and institutions were conducted. These include officials from the Lagos and Ogun states ministries of environment, physical planning, emergency management, Lagos Water Corporation, and National Meteorological Management Agency (NIMET). Others were National Emergency Management (NEMA), Department of Civil Engineering and Water Resources Management at the Federal University of Agriculture, Moshood Abiola Polytechnic, Abeokuta-Ogun State, and the University of Lagos respectively. They were asked questions that can help in understanding the applicability of the twenty (22) sub-indicators, clustered into six categories. Four focus group discussions were organized to accommodate the views of the communities that are affected by the flood caused by water release from the Dam in the River Basin. Each of the focus group discussion participants consisted of twelve (12) members for adequate representation of the different communities and span across different genders, ages, and statuses. The communities involved are Abule Otun, Riverview/Opic Estate communities in Abeokuta, Ogun State; Agiliti-Maidan Community and Ajegunle Owode community in Ikorodu, Lagos State. Nonetheless, it should be emphasized that the selection of the communities was done randomly out of all the communities that were affected by the flood (Table 1)

**Table 1: Names of communities used for the focus group discussion**

S/N	Name of Community	No of People	Composition
1	Ajegunle Owode Community Development Association	12	Executive members of the association, mixed (comprising of both middle & lower class educated & local people)
2	Agiliti Maidan Community Development Association	12	Executive members of the association, mixed (lower & middle class)
3	Abule Otun Community Development Association	12	The lower class, predominantly the local people and inherited property owners
4	Riverview/Opic Estate Community Development Association	12	Upper-class, predominantly educated and property owners

## Data and Data Analysis

The total number of interviews conducted was twenty-one (21). In pursuance of further information, discussions were held with the following focus groups: which were established to be affected flood communities and each group in the community consisted of 12 people who were the representatives of the Community Development Associations (CDAs). Moreover, the main crux of the analysis was embedded in the critical analysis of how suitable the 22 performance indicators selected from Hooper's (2006) 115 performance indicators were in the assessment of the Ogun-Oshun River Basin Development Authority concerning functions of dealing with flood prevention. The analysis was based on the data collected from the field study conducted in Ogun and Lagos States; the states downstream of Oyan River Dam, a tributary of Ogun River and under the jurisdiction of the Ogun-Oshun River Basin Development Authority (OORBDA). The 22 indicators that were put to test on the field were clustered into six categories namely: (1) Coordinated Decision-making, (2) Responsive Decision-making making 3) Organisational Design, (4) Training and Capacity Building (5) Information and Research, and (6) Private and Public Sectors roles.

Furthermore, the selected indicators were used to assess four key fundamental areas. First, the indicators were used to identify & examine the responsibilities of the Ogun-Oshun River Basin Authority in dealing with flooding due to the release of water from the dam (river dam flooding). Secondly, they were also used to identify and assess task distribution between different levels and agencies of government in flood control. The third reason is in the assessment of the impact of the task distribution on the performance of the Ogun Oshun River Basin Development Authority, and the last recommended mechanisms or strategies to improve the performance of basin organisations to address flood issues that are informed by the performance assessment indicators. However, the findings that helped to identify and examine the responsibilities of the Ogun-Oshun River basin authority in dealing with river dam flood prevention were considered vital to this report.

### The statutory responsibilities of Ogun Oshun River Basin

Development Authority as stated in the RBDA Act 1987 No 35 Section 1(4) titled "*functions of each Authority*" involves to:

- i. carries out a comprehensive development of both ground and surface water resources for multipurpose use specifically in the provision of irrigation systems, erosion, flood control and basin management.
- ii. build, operate and maintain the dams, dykes, boreholes, irrigation and drainage systems, and other facilities needed for the attainment of the Authority's function and entrust all lands under the irrigation plan to the farmers for cultivation.
- iii. supply water to all users from the Authority's completed storage schemes at a fee to be decided by the Authority and approved by the Minister; (the Minister in the Federal Ministry of Water Resources is referred to in this case)
- iv. build, control and maintain infrastructural facilities linking project sites such as bridges and roads provided such facilities form an important component and are incorporated in the lists of projects approved.
- v. Develop and maintain an up-to-date detailed water resources master plan, identify all the water resources requirements around the operation, by collation and collection of adequate socio-economic, water use and

environmental information of the basin.

However, the role of OORBDA in flood prevention downstream Oyan/Ogun River basin was identified and assessed using the pre-selected indicators examined below.

Concerning basin planning, it was clear enough from the initial response that the lack of coordination was reinforced by the non-existence of basin planning. Most importantly, the non-existence of a joint monitoring mechanism for a basin programme between OORBDA and other government institutions makes it difficult to involve other entities in basin planning for effective flood prevention. However, much emphasis was placed on the importance of basin planning to address institutional coordination, flood risk management, monitoring and information, and institutional arrangements that are enshrined in the thematic planning of a river basin. Nevertheless, it could be argued that the lack of appropriate basin planning and coordination between multiple agencies could have been addressed by the national water laws and policies.

### **Effectiveness of river basin organisation to prevent flood through risk assessment**

One of the major features of verifying the suitability of any performance indicator in assessing the effectiveness of a river basin organisation is to look for evidence that the basin management decision processes address critical problems first: e.g. water scarcity, flooding, droughts for very large and rapidly growing populations through risk assessment. The findings indicated that the sequential discharge of water from a dam reservoir before the commencement of the rainy season in the preceding year and sensitisation is the current measure put in place by the basin authority to control flooding in the lower Ogun River basin. The response was buttressed by the other respondents from states environment, physical planning ministries, emergency management agencies and the academia. The gradual release of water was an agreed measure between the basin authority, relevant government agencies/ministries and the downstream communities after the major flood disaster that occurred in the year 2010 and recent events in 2024. Several communities were displaced and rendered homeless, and properties were destroyed. These were the responses received from all the interviewees including the focus group sessions with some of the affected communities. Some of the communities affected as listed by the officials of States Emergency Management Agencies and States Ministries of Environment as well as a community leader including Abule Otun, Ajegunle, Agiliti, Kara, Ikosi, Isheri North, Isheri Olofin, Maidan, Mile 12 and owode onirin. Others were Riverview Estate, Spark light estate, Abule Apo, Akute, Warewa, Denro, Oluwakemi, Ojodu Abiodun and lastly Ishasi Igboko. The State Emergency Management Agency supposedly expended above million naira as compensation in year 2010 flood disaster in the latest flooding disaster, but the compensation to communities could not be ascertained. Furthermore, a sensitisation programme at the community level was also put in place by the basin authority as an effective measure in flood prevention/control but the degree of awareness is low, untimely and ineffective according to the community respondents.

In conclusion, the Ogun Oshun River Basin Authority management decision and decision processes from investigation may not have effectively addressed the flooding problem downstream Oyan/Ogun River as the agency did not seem to have taken effective measures in flood prevention within the study area. As part of the international best approach to flood prevention, the use of floodplains for developmental and other various purposes should be adapted to the existing risk. It was suggested that responsible basin organisations should provide reliable and timely flood warnings which are determined by correct response and preparedness level.

## Efficient Water Management Programme

Water efficiency as defined by Cai *et al*, (2003) is to reduce the quantity of water that is wasted by determining the quantity of water needed for a specific purpose, quantity utilised and distributed. To verify the applicability of the indicator, the question on the programme put in place for efficient water management within the Oyan-Ogun River basin was posed to the basin authority. According to the respondents, the programmes included the supply of water to States Water Corporation, the basin irrigation scheme and water production facility. However, it was surprising to discover that the irrigation scheme may likely still be lying fallow as at the time the study was carried out. Information as to the quantity of water distributed for irrigation could not be ascertained. Downstream Oyan dam, industrial activity was rarely observed as most areas had been used for housing development; rather a major hatchery organisation was observed along the Oyan dam route. Information also revealed that the supply of water for industrial uses was not presently taking place during the period the study was conducted. In contrast to the response from the planning and design department of the basin authority, the respondents from the state environment ministries and the academia were that because Oyan the dam was underutilised; the efficient water management program of the Ogun Oshun River basin authority could not be determined. This was also supported by some comments made at the meeting with some of the community associations. In line with best practices in river basin management where there is the presence of dam reservoirs, efficient water management is seen as a measure to address the problem of flooding downstream.

## Institutional Arrangements and Stakeholders Participation

In keeping with Jha *et al*, (2011) assertion, successful flood prevention cannot be achieved without a clear direction and roles of various agencies that might be responsible for flood control. A strong institution as suggested by Giordano and Wolf (2003) remains the key element in effective flood control by the river basin. To discover the evidence of institutional arrangements for basin management which specify the roles and responsibilities of different entities and stakeholders, the following questions were asked: Is the basin authority (OORBDA) autonomous; what is the highest decision-making body of the RBDA and how is the decision-making process carried out? What role does the ministry or agency play in flood prevention issues downstream Oyan/Ogun River basin? Responding to these, one of the respondents noted that the roles of other government bodies involved in flood prevention are embedded in the relevant law that established these ministries & agencies<sup>39</sup>. Moreover, Ogun Oshun River Basin Development Authority (OORBDA) is a parastatal of the Federal Ministry of Water Resources (FMWR) and reports and seeks approvals from the supervising ministry because the highest decision-making body of the authority is the board of directors. The response was also affirmed by other interviewees and the members of the communities. In addition, the roles of various stakeholders are defined in the relevant laws that established the agencies or ministries according to government policy at Federal and State levels as responded by other interviewees. The roles of the various stakeholders are outlined in Table 2.

Water resources management at the basin level that led to the development of the Ogun-Oshun River basin authority is on the legislative list of the Nigerian Constitution 1999. This means that the decision and decision-making process is fully centralised. Appointments of board members,

advisory councils, and determination of roles and responsibilities including programmes/projects are undertaken either via direct approval from the supervising ministry. According to the basin authority

**Table 2: Stakeholder Analysis of Case Study Area**

The stakeholder analysis table showed the influence or power each stakeholder has on the decision-making and implementation process of the Ogun Oshun River Basin Development Authority concerning flood-related matters downstream of the dam. The criterion was based on the power to influence the decision as identified during the study

S/N	Stakeholders	Characteristics	Role	Influence on Decision-Making
1.	State Ministry of Environment	Primary	Monitoring of river levels, awareness creation, construction and clearing of drainages, consultations	High
2.	State Ministries of Urban and Physical Planning	Primary	Development control to prevent flooding within the state including waterways. No. 35 vol 35 of 2nd September 2010 page A13 section states that the minimum distance to Ogun River should not be less than 100m. Monitoring awareness creation, and disapproval of developments on waterways serves contravention and demolition notices	High
3.	State water corporation	Primary	Supply of raw water from dam reservoir for production and domestic use. Expected to pay subsidies for the raw water produced from the dams	High
4.	National Emergency Management Agency (NEMA)	Primary	Provide early warning alerts from flood forecasting and predictions issued by Nigeria Meteorological Agency (NIMET)	High
5.	Federal Ministry of Agriculture Abuja	Primary	Promotion of agricultural development and national resources towards food security	Low
6.	State Emergency Management Agency (SEMA)	Secondary	Coordinates and responds to disasters/ provision of relief at state/disaster management at state level	Low
7.	National Red Cross Society	Secondary	Respond to disaster and relief	Low
8.	Ecological Office, Abuja	Secondary	Collaborate with authority on conferences and workshops	Low
9.	UNIDO, Abuja	Secondary	Projects, funding and training	Low
10.	JICA, Abuja	Secondary	Projects, funding and training	Low
11.	UNIDO, Abuja	Secondary	Projects, funding and training	Low
12.	The Communities	Secondary	Collaborate with authorities to prevent flooding and as a pressure group through consultation to prevent flooding in communities	Low

The investigation further indicated that stakeholders' meetings are at the instance of the basin authority, irregular and exclude the communities when decisions on flood and flood-related issues are to be made. According to the communities, a stakeholder meeting was held only once in the year when a major flood disaster occurred. This explains the rationale behind the ineffectiveness of the basin authority to tackle the problem of flooding in Nigeria because the management of Ogun River, the study area is not at the lowest appropriate level of basin management as explained in (Jaspers, 2003).

The findings of the study indicated that the stakeholders' involvement is perhaps inadequate especially the involvement of communities when decision-making of flood control measures are to be made. This is because community involvement may provide useful information (such as the topography of the area) that may help undertake the function of flood prevention effectively. "Stakeholders" is a convenient term that encompasses a wide array of individuals and organizations. Some stakeholders are individual water users, and others are organisations or groups of water users (e.g., utilities, industries, irrigation associations among others. Even central government officials or ministries may be stakeholders in a basin where the central government has a substantial interest, facilities or prior involvement" (Dinar et al., 2013).

#### Capacity building in flood prevention

The most common problem of many organizations can be attributed to a lack of capacity to respond to challenges by individuals in the organization. This called for capacity building within such organization to tackle the problems. The study looked for indications and evidence of training programs to improve the skill levels of river basin managers and stakeholders, specific to their situation. To achieve the objective, a question that would help the readers to understand if Ogun Oshun River Basin development authority has technical and competent staff to undertake the function of flood prevention. If the basin authority organises staff and stakeholder training and workshop programs specific to dam-related flood prevention?

Quoting the basin authority respondents "the authority has competent staff to tackle the problem of flooding within the basin". The investigation, however, indicated the non-availability of professionals in the field of meteorology, weather forecasting and prediction, surface water or groundwater hydrologists, and dam and/or basin management operators among others. It was not clear if the basin authority has a professional in the field of surface water hydrology; however, the total staff capacity was about three hundred and thirty-four staff members as at time of study. The respondents further noted that regular capacity development programs take place as evidenced by the availability of a training school on the premises of the basin authority and training programs for some members of staff took place during the field study. However, the relevancy of the training program to the current situation of flooding could not be determined. International training programs are conducted in collaboration with international donor agencies. Management training and development is indeed at this time in trendy because there is a significant increasing belief in the profits of investment in training and development. However, training should be tailored, designed and delivered to meet the organization staffs' specific needs. This means creating a course based on an identified skill gap or workplace issue (Smith and Piper, 1990).

#### Research

To have a deep knowledge of the OORBDA's responsibilities on flood control, there is a need to look at the level of research collaboration between the basin authority, research community,



government agencies and NGOs. The question sheds more light on how Ogun -Oshun River Basin Authority carries out research with flood, dam river flood prevention and the current research program in flood-related issues. Unfortunately, research is only carried out by the academia with no link or connection with the basin authority. All the respondents from the ministries and agencies informed that no research was conducted on flood and flood-related issues. Investigation showed that no relationship exists between the basin authority with the research community. Unfortunately, the government is perhaps not making use of the best brains that are available in the academic environment to provide the solution to the persistent flood problem of the Ogun River Basin. There is no evidence of a research department and yet does not collaborate with other institutions. It is through information and research that the OORBDA can acquire more knowledge and the know-how that is needed for an adequate response to the flood problem. Agreeing with (García-Hernández, 2011), the essential element of flood prevention is the availability of information through research and numerical meteorological data (observed or predicted) to develop a warning system primarily for the basin to provide a flood warning report.

Assessing the task distribution and impact of the task distribution on the expectation of the performance level of basin organisation in flood prevention

Identifying and assessing both task distribution between various government agencies in flood control and the impact of such task distribution. Nine (9) indicators were used to assess the performance of the Ogun Oshun River Basin Development Authority (OORBDA) concerning the objectives and goals of the study. However, the findings indicated that the relevant laws establishing the various agencies of government involved in flood prevention specify the tasks or roles of these agencies according to the specific federal and state situations. On the other hand, a problem arises because certain sectors are under the legislative list while others appear on the concurrent list in the Nigerian constitution. The management of water resources is a legislative list that gives sole authority or power to the Federal government on water-related issues in Nigeria, the environment and physical planning sector is under the concurrent list. This means that both federal and state governments have the power and authority to control physical planning/environment-related matters. However, these have been effectively carried out by both federal and state governments through the creation of relevant agencies to prevent flooding resulting from the Ogun River basin. Such agencies include but are not limited to state water corporations, the state ministry of agriculture, the land use bureau, physical and urban planning, and the environment among others.

Tasks distribution according to the findings of the study was inadequately distributed among the different agencies involved in flood prevention and not clearly defined - (the how and what were left unattended) in the relevant laws for managing water resources to prevent flooding within the Ogun River basin at the level of different tiers of government. Given the above, the lack of coordination, integration, uncooperative attitude and duplication of roles assigned to the various agencies involved in flood prevention are the reasons for the flooding problem experienced presently downstream of the Ogun River basin.

Coordination Arrangement between National & States Government on Basin Management for Flood-Related Issues

The indicator is very essential in investigating the presence of coordination activities (joint programs of action,

dialogues and memoranda of understanding) between states for river basin management. For adequate assessment of the OORBDA, it is imperative to know the relationship of the basin authority with relevant MDAs. The respondents noted that the relationship is cordial and that the relevant MDAs are in constant communication with the basin authority especially the Lagos State Ministry of Environment. However, the cordial relationship does not mean that the coordination and cross-sectoral arrangement among the various MDAs in flood prevention are not without flaws. Although, the roles of various relevant government agencies were defined in the law's establishment laws, "the how and what" were not clearly or specifically defined. For instance, the RBDA Act does not specify how the basin authority would liaise with other government MDAs in their effort towards achieving the objective in flood prevention; the programs to be undertaken by the basin state government were not equally defined. Furthermore, it was stated that the basin authority through the supervising Ministry shall forward a copy of the annual activity report to the state government around operation. so much ambiguity was seen in the RBDA Act 1987 No 35. The task distribution from the information gathered was not well defined and harmonised. Therefore, a lack of defined and adequate coordination arrangements and task distribution of roles of various relevant government bodies at all levels may be deduced as the reason for the inability of the basin authority to effectively tackle the flooding problem downstream Oyan/Ogun River basin.

### **Consensus-Based Decision Making**

According to Hasson and colleagues, there are quite many approaches that can be employed for multi-stakeholder decision problem solving, most especially among groups that have disagreeing views among each other "Multi-criteria methods can be used for such decision making since they include weighting functions". One of the key points of the framework is to gain the trust of all participants: local and central government, other politicians, insurers, and other stakeholder groups. Thus, the decision method should employ familiar concepts as possible while maintaining efficiency (Hansson et al., 2008). The use of consensus-based decision-making in basin-wide planning and management to balance all user needs for water resources and to provide protection from water-related hazards is one of the key indicators that can be employed in the assessment of the OORBDA performance on flood control. Consequently, it was vital to understand whether the RBDA engages in a consensus-based decision approaching basin management decision-making; whether the interests of stakeholders are considered and how the stakeholders are involved in decision-making and process. Quoting one of the top officials of the basin authority for the first question, "he noted not really" but quickly added that the interests of stakeholders are considered on issues related to basin activity, particularly in flood prevention. The representatives of some government MDAs on the advisory committee and state representatives on the board of directors make evident that stakeholders' interests are considered in decisions made. Moreover, the respondents from the state's environment ministry noted that the ministry is not involved in decision making rather the ministry advises the authority on flood-related issues as it concerns the states downstream of the Oyan-Ogun River basin. On the other hand, the academia informed that consensus-based decision-making approach is not being considered as relevant government MDAs are not involved in the process. Often decisions taken at the authority level are dependent on the approval of the supervising ministry. It was evident that there is a lack of consensus decision-making as other agencies were not involved in decision-making. This gives room for ineffectiveness by the basin authority in flood-related issues

but also in other functions and responsibilities. Extensively, the maximum effect of flooding is on the communities downstream of the Oyan-ogun River basin. Thus, an investigation was carried out on some of the affected communities on the community involvement in decision-making and process. About twelve (12) communities engaged gave similar resounding answers and expressed their dissatisfaction with the neglect by the basin authority in the process of decision-making on matters that affected the communities. For instance, one of the participants from the Agiliti community noted and quoted him:

“Nobody called us for a meeting when the time comes to make a decision; this is not good enough because we are the ones that suffered most during the time of flooding. Getting our opinion would have assisted them greatly in providing a solution to flood management”

These were the words of another participant from the River View Estate community. In addition, another participant contributed from the Ajegunle Owode community thus:

"The fact that we were not involved in the decision-making does not necessarily mean we should not lobby and agitate for our interest to be protected when the basin authority is taking decisions that affect us all. We do many lobbies, and we do see our interest protected in some cases"

The gradual release of water from the dam was cited as an example where the interests of stakeholders were considered. Regardless of the level of involvement in decision-making by stakeholders and communities, it was evident that consensus-based decision-making was not in practice by the Ogun Oshun River Basin Development Authority.

#### Clearly Defined Roles of Private Sector/Public

During the whole study process, there was no evidence of clear specification of the private sector involvement and links to basin decision systems. All the responses from the various respondents indicated the non-involvement of the private sector in basin management in Nigeria except the academic representative who noted that the private sector involvement is in emergency assistance that is material and/or financial assistance for victims of flood.

#### Organisation Structure and the Problem Analysis (Oyan dam operations)

This indicator helped to look in the evidence if the organization type reflects prevailing needs for river basin management. Information gathered from all interviewed respondents indicated that the organization structure is a hierarchical type of structure. The Basin Authority reports to the supervising ministry and seeks approval for decisions/projects on their activity (OORBDA). The findings show that hierarchical organisation type does not reflect the prevailing basin authority as bureaucratic bottlenecks are involved which does not allow for effective flood prevention. Besides, the hierarchical structure does not give room for responsive decision-making in flood-related situations.

The Oyan River Dam, which was commissioned in 1983, is in the southwestern part of Nigeria, Abeokuta North local government area of Ogun State. The dam is on Oyan River, a tributary of the Ogun River; moreover, there is Ikere Gorge Dam on the Ogun River at Iseyin in Oyo state. Ikere gorge has no radial gates and flows into Ogun

River year-round. According to the Ogun Oshun Basin Authority respondent, Oyan dam was constructed at supply to Abeokuta and Lagos and flood prevention but has potential use for generating electricity the instance of Lagos and Ogun States government to resolve the problem of water shortage at that time<sup>64</sup>. The main purpose is for raw water and irrigation. However, at the time of the visit, the Oyan River was used for fishing activity, and raw water supply to Lagos and Ogun water corporations on request while the hydropower facility had not been functional since inception.

Furthermore, the crest is 11km in length and the maximum height of the crest is 32.5 metres. While the normal (design) water level (N.W.L) of the service spillway capacity is 2271 cubic metres per second, the maximum water level (M.W.L) is 3440 cubic metres per second. The reservoir, on the other hand, is 27km in length and at normal water level, maximum width of 6 km (N.W.L) while the water storage capacity is 270 million cubic metres with a surface area of 40 square km also at N.W.L. However, the maximum power-generating capacity of the dam is 9000 kilowatts. In addition, the dam has four radial gates, a butterfly valve, a regulating valve and raw water pump control (used for pumping raw water to the staff quarters and water treatment plant. The gates are opened either mechanically or electrically and manually by winding the lever for 20 minutes while the opening of the gates could be from 1 - 100% depending on the level of water in the reservoir. Also, the release of water to Lagos Water Corporation is done by the opening of the radial gates which is the maximum water release, and the butterfly valve is used for water releases to Ogun Water Corporation. However, at the time of the visit, the radial gates had been closed; the water level was 59.03 metres while the maximum and minimum levels were 63 m and 55 m respectively. According to the respondents, water releases through the radial gates could only be done when the water level is above 55 m level, but at 55 m, releases could be done through the butterfly valve<sup>65</sup>.

Suffice it to mention that the release of water by the basin authority to the water corporations from Oyan dam is done on request and at a specified fee. Such requests are made during the dry season. According to the respondents from the state water corporations, water release from the Oyan dam reservoir is made only when the water level at the Ogun River intake point of abstraction is below 1m. That is when water from Ikere gorge dam is no longer flowing adequately or a prolonged dry season<sup>66</sup>. Water is stored and retained at the maximum level of about +60 metres in Oyan dam reservoir till another rainy season and when the maximum dam capacity is reached. Then the sudden release of water is carried out to avoid total collapse of the dam.

Further investigation indicated that the irrigation scheme of the basin authority had been abandoned although information from one of the interviewees was that the irrigation scheme was functional. Certainly, there is enough water stored in Oyan Dam reservoir to help alleviate problems of water scarcity or inadequate supply to meet the growing water demands of Lagos and Ogun states, as most communities around the Ogun River basin lack access to potable water and the communities with access to potable water made personal provisions. The visit to Lagos Water

Corporation revealed that the corporation is currently expanding the corporation's storage capacity. The presence of an anti-salinity wear was observed but was informed that the purpose of the anti-salinity is to help maintain a flow of water abstraction point. Request for raw water from basin authority is done to maintain the water balance of the suction head of the pump because the minimum attainable height for abstraction is about 1.5m. In addition, the Lagos corporation's current production facility at Ogun River intake is about 48,000 million gallons per day

(216,000,000 litres per day) without constraints. With constraints, it is between 36-38 million gallons per day which could be estimated at 167,000,000 litres per day at an average velocity of 1.6 cubic metres per second. At Ogun Water Corporation, a question was asked: "Why does the corporation not request water from the Oyan dam reservoir to help reduce the problem of flooding". The respondent blamed the corporation's inability on the failure of water users to pay water rates. Again, a follow-up question was asked to know if there is a monitoring and enforcement programme or team put in place to ensure that water rates are paid; then the respondent withdrew and informed that such questions should be directed to the scheduling officer. A rough estimate of the number of people affected by the flooding downstream of Ogun River both Lagos and Ogun States could be about two million people. Several reasons such as lack of coordination, cooperation and integration or harmonisation of roles, ambiguity in the law, and lack of politics, among others, were deduced to be the reason for the ineffectiveness of the Ogun Oshun River Basin authority to tackle the problem of flooding downstream Oyan/Ogun River basin.

According to the International Commission on Irrigation and Drainage Report (ICID) ([http://www.icid.org/dam\\_pdf.pdf](http://www.icid.org/dam_pdf.pdf)) a large fraction of water stored in dam reservoirs is mainly utilised for irrigation purposes globally. While a smaller fraction of the dam reservoir is supplied for industrial, domestic and hydroelectricity generation purposes. Dams were used years ago to increase crop yield to meet the ever-growing population towards ensure food security. Oyan dam operations negate the original purpose for which the dam was built as well as the good operational practice.

The report has been able to bring to the fore a clear understanding of the first three specific research questions which aimed towards identifying and examining the responsibility of the OORBDA in dealing with flood prevention. This assessment and identification of the responsibility of the basin authority was done using nine (9) different indicators. The indicators include the use of multiple agencies, basin planning, national water law/policy, the effectiveness of river basin organization to prevent flood through risk assessment, efficient water management program, institutional arrangement, stakeholder participation, and capacity building in flood prevention. Also, the study was able to critically assess the task distribution and impact of the task distribution on the expectation of the performance level of OORBDA in flood prevention. This was done using indicators such as coordination arrangements between national and state governments on basin management for flood-related issues, organization structure, community participation, best management practice, clearly defined roles of private sector/public, dialogue approach in decision making, and linkage between basin organisation & government decision making. This without a doubt provided deep insight into the performance level of the OORBDA. Discussing the statutory responsibilities of OORBDA in flood prevention and bringing to the fore the problem of Oyan dam (Figure 3) created a platform that allows the reader to comprehend the impact of the indicators that were used in juxtaposing the responses of the respondents at OORBDA. By and large, this report has made the task of identifying the suitable and the unsuitable indicators in assessing the performance of OORBDA that the study.

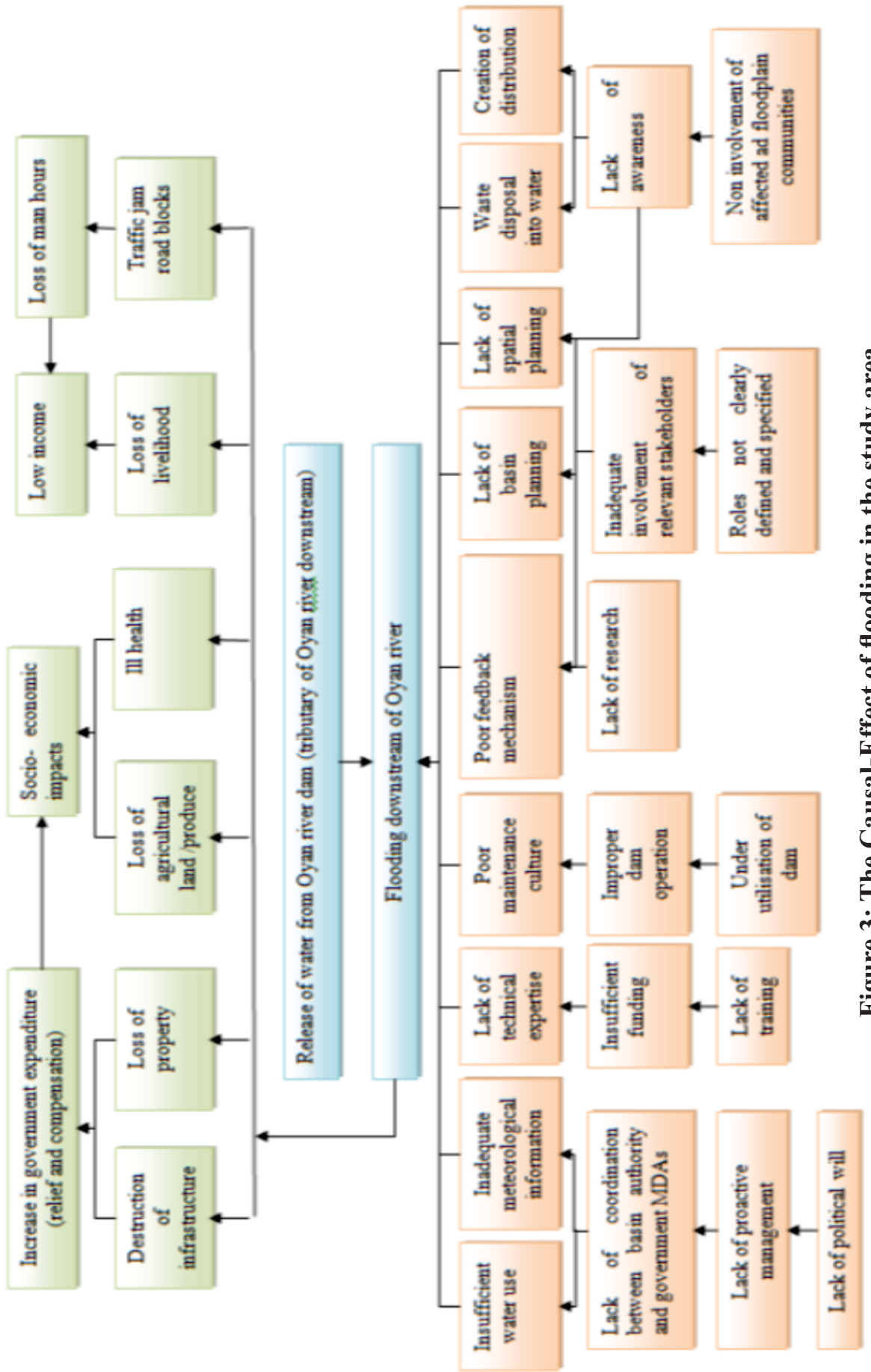


Figure 3: The Causal-Effect of flooding in the study area

## Conclusion and Recommendations

Given the objective of the research study, we have been able to identify the key performance indicators that are suitable for the performance assessment of OORBDA. Twenty-two (22) indicators clustered into six categories namely: coordinated decision-making, which focuses on the existence of high-level, cross-sectoral policy links between natural resources management and other sectors (water users) (2) Responsive decision-making that emphasises evidence of dialogue to be used as an instrument of decision-making on preferred management options – as in open meetings, tribunals, forums (3) Organizational design that seeks evidence of institutional arrangements for basin management which specify roles and responsibilities of different entities and stakeholders, and the existence of water law and policies. Other categories include (4) Training and capacity building which describes the mechanism of building human capacity related to the administrative, economic and political setting within the country of operation (5) Information and research that considers interagency cooperation and accessibility of information by relevant stakeholders a necessity in flood control. The last category is Private and public sector roles which, suggest strong community awareness and participation processes to enhance greater ownership of basin-scale plans of action as a strong indicator for effective management of the RBO. Not all the selected indicators are applicable and suitable for the assessment of the OORBDA in flood prevention. 18 indicators out of the 22 were assessed as suitable for evaluating the performance of river basin organizations dealing with flood control. Three were identified as not suitable while one could not be determined. Furthermore, the distribution of tasks among the different agencies involved in flood prevention was assessed which turned out not to be adequate and clearly defined - (the how and what were left unattended) in the relevant laws for managing water resources to prevent flooding within Ogun River basin at the level of different tiers of government. The study identified the lack of coordination, integration; uncooperative attitude and duplication of roles assigned to the various agencies involved in flood prevention are the reasons for the flooding problem experienced presently within the Ogun River basin downstream of Oyan dam. The overall task distribution between different levels and agencies of government in flood prevention within the Ogun River Basin under the authority of the Ogun -Oshun River Basin Development Authority is however not effectively harnessed to prevent flooding that occurs due to the release of water from the dam especially between the Authority, state water's corporation and the agricultural agencies.

Moreover, the various factors that are responsible for ineffective operational activity to prevent flooding within the Ogun River basin were discussed. The study identified river basin management centralisation in Nigeria as one of the likely reasons for the ineffective operational activity to prevent flooding within the Ogun River basin. Despite the involvement of the state government in basin management, however, state governments are involved in basin management concerning land allocation or development. This is because the federal government is in control of water resources while land resources are controlled by the state governments and basin management includes both land and water, the reason for haphazard or ineffective task distribution among the different levels of government. Secondly, the political reasons as the political ideologies of the federal and basin states of the Ogun-Oshun basin authority differ. Suffice it to mention that three (3) indicators were assessed as not suitable while one (1) indicator could not be assessed as suitable or unsuitable due to lack of information availability in the study area

## Recommendations and suggestions for further research study

The following recommendations are hereby proposed towards effective river basin management in flood prevention.

- a. Proactive river basin management starting with the appointment of relevant technical and professional manpower in specialised fields such as river basin management, dam operations, and ground and surface water hydrologist among others.
- b. Collaboration with international institutions and donor agencies for local or tailored training in other relevant fields such as planning, and flood risk assessment among others.
- c. Re-structuring of the organisation to accommodate and include relevant departments or units such as flood and erosion control, planning, training, hydrological or meteorological units and others as separate entities and clearly defined roles and authority.
- d. Adequate involvement of relevant stakeholders and community participation that would create awareness to living in floodplain areas.
- e. Establishment of a monitoring team and determination of accurate data or information of the various water users within the area of operation.
- f. Effective coordination arrangements among the relevant agencies involved in flood prevention.

However, effective river basin management at the international level in our opinion may be tackled using a bottom-up approach. A situation where the various challenges, issues, water policy and laws particular to each country may be utilised to determine the relevant and appropriate achievable policy at the global level.

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## 11. Public Policy and Sustainable Development: Assessment of The Roles of Research Output In Nigeria

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### Abstract

*Research output, in terms of scientific studies and data analysis, plays a critical role that significantly influences, drives and shapes public policy decisions, especially on sustainable development in any society. As far as Nigeria is concerned, there is the absence of coordination between different research institutions in the country, likewise, there is a paucity of research findings and a lack of capacity to utilise these findings by policymakers. All these have posed serious challenges to national growth and development in Nigeria. This study assesses the role of research outputs on public policy and sustainable development in Nigeria. The study was anchored on evidence-based and policy cycle theories. It employed the interpretivism philosophy and a qualitative research approach in data collection and analysis. Secondary data were sourced from journals, the internet, newspaper publications, and editorial reports. The findings of the study revealed that research output plays a critical role in the public policy process and sustainable development as it helps not only to identify but also to address the root causes of problems and develop innovative solutions to the challenges of sustainable development in developing nations like Nigeria. Also, research output provides policymakers with evidence-based information that can be used to make informed decisions. The study concludes that although there has been a growing emphasis on research in recent years in Nigeria as the government has established many research institutes and universities and increased research funding, such efforts have not led to a significant increase in research outputs that could enhance sustainable development in the country. The study recommends among others that there should be collaboration between researchers and policymakers, as well as data accessibility, and the willingness of policymakers to engage with research findings. It is therefore crucial to create mechanisms that promote the use of research in policy formulation, implementation, and evaluation to maximise its impact on sustainable development in Nigeria.*

**Keywords:** Nigeria; Public Policy; Public Policy Process; Research Output and Sustainable Development.

### Introduction

Research output plays a multifaceted function in driving sustainable development by providing knowledge, informing policy, fostering innovation, and addressing specific challenges across various sectors of the economy (Jegade, 2023). In Nigeria, research output plays a germane role in public policy through the provision of evidence-based information to help policymakers make better decisions about a wide range of issues ranging from education, social, and healthcare to economic development and environmental protection (Okonkwo, 2022). It serves as a foundational pillar for the country's progress toward a more sustainable future. More so, research output plays an important role in public policymaking in Nigeria. It can be used to identify problems, develop solutions, and evaluate the effectiveness of policies (Adesina and Ogunsanwo, 2022). Research output is essential for sustainable development in Nigeria as it helps to identify and address the country's most pressing challenges, such as poverty, unemployment, climate change, and environmental degradation (Jegade, 2022). UNESCO (2021) studies reveal that research output has shown that the conditional cash transfer program in Nigeria has been effective in reducing poverty and improving school attendance. This information can be used to

design and implement other social programs in Nigeria. Okonkwo (2022) opines that research output can help to identify the most pressing problems facing Nigeria and to prioritize the allocation of resources to address them. Similarly, Afolabi and Adedeji (2022) study contends that Nigeria has a high rate of maternal mortality and research information can be used to inform policies to improve maternal health care. Thus, research can also help to develop new technologies and solutions that can improve the lives of Nigerians.

It is instructive to note that research outputs have been used to make informed public policy decisions by the Nigerian government on issues such as causes of conflicts and strategies to prevent conflicts (Jegede, 2023). Also, the output of research on the impact of poverty has been used to develop programs to alleviate poverty in the country. Similarly, research output on the effectiveness of different educational methods has been used to improve the quality of education in Nigeria. IPCC (2019) also claimed that research on the impact of climate change has been used to develop policies to mitigate climate change. This, no doubt, can lead to more effective and efficient policies that improve the lives of Nigerians. In addition, research outputs identify opportunities for economic growth and diversification. By studying industries like agriculture, technology, and manufacturing, researchers help to identify ways to stimulate economic growth and create jobs, contributing to long-term sustainability (Salawu and Ogundele, 2021). Thus, research output can identify opportunities for economic growth and diversification in Nigeria. Adebayo, Abiodun and Ogundele (2023) also asserted that research outputs are useful in generating new knowledge, technologies, and innovations that can lead to improved agricultural practices, renewable energy solutions, and healthcare advancements, all of which contribute to sustainable development. Furthermore, it is important to state that research outputs inform evidence-based policymaking because whenever policymakers have access to well-researched data and analysis, they can create policies that address specific sustainable development challenges, such as high-rate poverty reduction, falling standard of education, and environmental conservation problems (Salawu and Ogundele, 2021). Not only that. Research outputs help in identifying and addressing environmental issues like deforestation, pollution, and climate change. Thus, without doubt, research output can lead to the development of sustainable practices and technologies that reduce environmental impact.

Consequently, research contributes significantly to education and capacity building by providing insights and knowledge transfer which empowers individuals and communities to participate in sustainable development initiatives (Jegede, 2022). It seeks to identify the specific needs and challenges of local communities, helping organizations and governments tailor development initiatives to meet those needs effectively. It also highlights social inequalities and injustices, prompting action to promote inclusivity and social equity, which are fundamental aspects of sustainable development. It is because of this that the study assesses the role of research outputs in Nigeria on public policy process and sustainable development.

### **Statement of the Problem**

Like many other developing nations, Nigeria faces multifaceted challenges in achieving sustainable development. To achieve sustainable development, it is essential to evaluate whether research output contributes to long-term sustainable solutions or if policies are primarily reactive and short-term (Jegede, 2023). More so, regional disparities in research output and its impact on policy processes and sustainable development efforts must be explored, as Nigeria is a diverse country with varying socio-economic challenges across regions

(Adesina and Ogunsanwo, 2022). It must be emphasised that in most cases, Nigerians are often apathetic about the public policy process. The reasons for this may not be unconnected with many factors, including a lack of trust in the government, and the belief that they cannot make a difference (Adebayo and Azeez, 2022). Also, the government often lacks the necessary data and information to make informed decisions about public policy. Again, the reasons for this include poor data collection and management practices, and a lack of coordination between different government agencies (Salawu and Ogundele, 2021). There is no doubt that insufficient resources and limited capacity-building efforts within the research community hinder the generation of high-quality research output, limiting its potential impact on policy formulation and implementation. It is therefore necessary to assess the monitoring and evaluation mechanisms in place for tracking the impact of research on policy outcomes and sustainable development initiatives in Nigeria (Adebayo *et al.*, 2023).

Furthermore, the underutilization of research output forms part of the challenges of the public policy process in Nigeria. Despite the presence of numerous research institutions and scholars, there seems to be a significant lacuna between research findings and their incorporation into policy development and implementation (Jegade, 2022). Also, there is a disconnection between researchers and policymakers in Nigeria. Adesina and Osabuohien (2022) asserted that there is a lack of effective collaboration and communication channels that hinder the transfer of research findings into actionable policy recommendations, leading to a gap between evidence-based research and policymaking. Thus, the effectiveness of institutional frameworks and governance structures in facilitating the integration of research output into policy processes needs to be examined.

In addition, the quality and relevance of research conducted in Nigeria need to be assessed. It is important to investigate whether research efforts align with the country's development goals and address pressing socio-economic and environmental issues (Jegade, 2023). Ogunsanwo (2017) argued that the accessibility of research findings to policymakers, civil society organizations, and the public is often restricted. The implication of this is that limited access to research output may hinder informed decision-making and impede sustainable development efforts (Okonkwo, 2022). Even when research findings are incorporated into policies, challenges often arise during the implementation phase. Therefore, understanding the hurdles faced in translating policy recommendations into tangible actions is crucial for achieving sustainable development.

Previous studies by Adebayo and Azeez (2022), Jegede (2023), Afolabi and Adedeji (2022), Adebayo *et al.*, (2023) have addressed the grey areas such as bureaucracy, corruption, and political influence that affect the utilization of research outputs in policymaking process, yet these studies failed to focus on the statutory institutions that are managing research outputs in Nigeria. No doubt addressing the problems requires a comprehensive examination of the role of research outputs in Nigeria's public policy process, identifying bottlenecks, and proposing strategies to enhance the utilization of research for the advancement of sustainable development in Nigeria which form the basis of this study. Thus, the identified gap in knowledge that this study intends to fill is to examine the role of the National Assembly Research Service and the National Research Foundation of Nigeria which provides research support to members of the Nigerian Parliament, responsible for funding and coordinating research in Nigeria as well as the development of public-private partnerships between research institutions and government agencies.

## Literature Review

In this section, attempt is made to do brief conceptual and theoretical reviews and critically review, assess and evaluate the nexus between policy process, research output and sustainable development in Nigeria.

## Conceptual Review

The public policy process is the process by which the government makes decisions about the allocation of resources and the implementation of programmes and policies (Adeoti and Salawu, 2020). Public policy is the course of action taken by governments to address public issues and challenges. It encompasses laws, regulations, programmes, and initiatives aimed at achieving specific goals in areas like education, healthcare, the environment, and economic development (Ajulor, 2016). The significance of public policies is to shape the lives of citizens, influencing their opportunities, well-being, and environmental sustainability. Effective policies can drive positive change, while poorly designed ones can have detrimental consequences (Ogunsanwo, 2017). It is a complex and often fragmented process, involving a wide range of actors, including government agencies, interest groups, and the public. Also, the policy process typically involves several stages, including agenda setting, policy formulation, policy adoption, implementation, and evaluation (Adebayo *et al.*, 2023). Each stage involves various actors, like government officials, experts, stakeholders, and citizens. The policy process can be complex, with competing interests, information gaps, and political pressures influencing outcomes (Afolabi and Adedeji, 2022). It ensures transparency, inclusivity, and evidence-based decision-making, which is crucial for effective policy development.

More so, sustainable development refers to the balanced and inclusive growth of a country that meets present needs without compromising the ability of future generations to meet their own needs (Jegede, 2022). Hence, it aims to meet the needs of the present without compromising the ability of future generations to meet their own needs. Adebayo and Azeez (2022) assert that the goal of sustainable development provides a framework for evaluating and designing public policies, ensuring they consider long-term consequences and intergenerational equity (Adebayo *et al.*, 2023). In Nigeria, achieving sustainable development necessitates addressing issues like poverty, inequality, environmental degradation, and climate change. Public policies should be designed with a long-term perspective and integrate environmental, social, and economic considerations, as they serve as critical tools for promoting sustainable development (Jegede, 2023). Policies can incentivize renewable energy, protect ecosystems, promote social equity, and foster economic growth that respects environmental limits.

## Theoretical Underpinning

This paper is situated within the context of evidence-based and policy cycle theories which are considered suitable for the analysis of the research.

Evidence-based theory emphasises the relevance of employing research to guide policy decisions (Akinwale and Adegboye, 2018). According to this theory, policymakers should be influenced by credible, relevant, and high-quality research evidence (Adeoti and Salawu, 2020). It argues that policies based on evidence are more likely to be successful, equitable, effective, and efficient. This means that politicians should evaluate the best available evidence when developing and implementing policies, rather than relying solely on intuition, ideology, or special interests. In the context of Nigeria, evidence-based policymaking is critical for addressing the country's

numerous challenges, including poverty, inequality, environmental degradation, and insecurity (Adebayo *et al.*, 2023). Research outputs from Nigerian universities, research institutions, and civil society organisations' can provide valuable insights into these challenges and potential solutions.

On the other hand, policy cycle theory describes the different stages of the policymaking process, from agenda-setting to policy implementation and evaluation (Jegede, 2022). This theory presents the policymaking process as a cyclical sequence of stages: problem identification, agenda setting, policy formulation, implementation, assessment, and feedback. Understanding these stages can help us identify the points at which research outputs can have the most impact on policy (Akinwale and Adegboye, 2018). In Nigeria, the policy cycle is frequently characterised by weak linkages between research outputs and public policy (Onwuchekwa, 2017). Research outputs often fail to reach policymakers or are misapplied as they are not used effectively in the policymaking process by policymakers. This can be attributed to many factors, including poor communication and collaboration between academics and policymakers, unawareness among policymakers of the value of research evidence (Akinwale and Adegboye, 2018), inadequate capacity within government agencies to translate research findings into policy recommendations, as well as political and bureaucratic obstacles to evidence-based policymaking.

Furthermore, low institutional ability and coordination impede successful evidence-based assessment implementation. Corruption has the potential to alter policy goals and execution, but a lack of openness can impede public scrutiny and accountability (Okolo and Okoye, 2012). Short-term political pressures, political cycles, and interests can jeopardise long-term sustainable growth. To close the gap, the government can use tactics such as investing in research infrastructure, financing, and researcher training to increase the quality and quantity of research.

Besides, limited institutional capacity and coordination impede the effective implementation of evidence-based evaluation. Corruption has the potential to alter policy goals and execution, while a lack of transparency can impede public scrutiny and accountability (Okolo and Okoye, 2012). Short-term political pressures, short-sighted political cycles, and interests can jeopardise long-term sustainable development. To close the gap, the government can employ strategies such as investing in research infrastructure, financing, and researcher training to increase the quality and quantity of research outputs (Akinwale and Adegboye, 2018). This has the potential to improve communication and knowledge translation.

### **Public Policy Process and Sustainable Development in Nigeria.**

Public policy process in Nigeria plays a pivotal role in advancing sustainable development. No wonder that Ajulor (2016) asserted that achieving sustainable development requires a well-structured public policy process that incorporates economic, social, and environmental considerations. Ojo and Adeyemi (2022) also opined that the public policy process and sustainable development are critical aspects of the governance and development efforts in Nigeria. Hence, effective policy formulation, implementation, monitoring, and evaluation are essential for achieving sustainable and inclusive development in Nigeria. Afolabi and Adedeji (2022) also argued that the public policy process and sustainable development are intertwined in Nigeria as it can be divided into the following stages.

1. **Problem identification:** The first step is to identify the environmental and social problems that need to be



addressed. This can be done through a variety of methods, such as surveys, interviews, and focus groups.

**2. Policy Formulation:** Once the problems have been identified, the next step is to develop policy options to address them, and this can be achieved through government agencies and stakeholder engagement (Ajulor, 2016). The Nigerian government, through various ministries, agencies, and commissions, plays a pivotal role in policy formulation. These organisations conduct research, gather data, and analyse information to identify areas where sustainable development is needed (Ojo and Adeyemi, 2022). Also, policymakers often engage with stakeholders, including civil society organisations, non-governmental organisations (NGOs), private sector actors, and local communities, to gather input and perspectives on sustainable development issues (Adebayo *et al.*, 2023). Consulting with stakeholders will promote a range of different solutions by weighing the costs and benefits of each.

**3. Policy adoption:** For a policy to be adopted, it has to be analysed to assess its potential economic, social, and environmental impacts. This analysis helps ensure that policies align with sustainable development goals which makes it the third stage of the policy process (Adesina & Okeke, 2022). Cost-benefit analysis (CBA) and Environmental Impact Assessment (EIA) are considered for policies to evaluate and mitigate any adverse effects, and this is done by the government, usually through a legislative process (Jegede, 2023).

**4. Policy implementation:** Once a policy has been adopted, it needs to be implemented. This can be achieved through capacity building and ensuring that resource allocation is carried out effectively and efficiently. Adebayo and Azeez (2022) stated that implementing sustainable development policies often requires building the capacity of government agencies and other stakeholders to execute programs effectively. Also, adequate budget allocation and resource management are essential for policy implementation (Adeoti and Salawu, 2020). Hence, Nigeria's budget process should prioritize sustainable development policy into practice as this can assure a better research output.

**5. Policy monitoring and evaluation:** This involves assessing whether the policy has achieved its intended objectives and identifying any unintended consequences, and this can be actualised through data collection and accountability (Adebayo *et al.*, 2023). Regular data collection and analysis are crucial to track progress toward sustainable development goals. This includes economic indicators, social development metrics, and environmental data. Jegede (2023) stated that effective monitoring and evaluation mechanisms hold policymakers accountable for achieving sustainable development targets.

**6. Adaptation and Review:** The final stage is to adapt and review the policy for flexibility. Sustainable development policies should be adaptable to changing circumstances and emerging challenges (Jegede, 2022). Afolabi and Adedeji (2022) emphasised on the need to review policy periodically to ensure that the policies remain relevant and effective in achieving sustainable development objectives.

It is instructive to note that the National Renewable Energy Policy (2015), National Sustainable Development Strategy (2015), and National Sustainable Development Goals (SDGs) Implementation Plan (2016) are few examples of the many public policies that have been implemented in Nigeria to promote sustainable development.

### **Public Policy and Sustainable Development: Assessment of the roles of Research Output in Nigeria.**

Research output plays a vital role in public policy and sustainable development in Nigeria. It can help to make

informed policy decisions, identify challenges and opportunities, and develop solutions to complex problems (Ojo and Adeyemi, 2022). The role of research output in Nigeria's public policy and sustainable development efforts is significant. Research serves as a crucial foundation for informed decision-making, policy formulation, and the attainment of sustainable development policies (Ogunlade, 2021). However, it is essential to acknowledge that for research to have a meaningful impact on public policy and sustainable development in Nigeria, several challenges must be addressed. These challenges include funding constraints, capacity-building needs, data availability and quality, and the translation of research findings into actionable policies (Jegade, 2023). Addressing these challenges is essential to maximize the positive role of research in Nigeria's development journey.

However, Adesina and Okeke (2022) identified areas where research output plays significant roles in Nigeria's public policy and sustainable development. In their view, these include:

1. **Informed Policy Formulation:** Research output helps to form policy decisions by providing evidence-based information on the likely impacts of different policy options. Research provides policymakers with valuable data, evidence, and insights to understand the current state of affairs and identify priority areas for sustainable development (Jegade, 2023). Also, policy proposals and recommendations based on well-conducted research are more likely to be effective and targeted towards addressing specific challenges (Adebayo *et al.*, 2023). In Nigeria, research output has been used to form the development of the National Sustainable Development Goals (SDGs) framework.
2. **Identifying Challenges and Opportunities:** Research output also helps to identify the challenges and opportunities facing Nigeria in terms of sustainable development (Jegade, 2022). Output of research in environmental science and ecology is crucial for designing policies that address environmental degradation, climate change, and natural resource management which will promote environmental sustainability (Afolabi and Adedeji, 2022). Adebayo and Azeez (2022) asserted that environmental impact assessments and studies on sustainable practices inform policies aimed at reducing environmental harm and promoting sustainability. For example, research has shown that Nigeria is facing many environmental challenges, such as climate change, deforestation, and pollution. Research output helps to identify opportunities for sustainable development, such as the potential for renewable energy and agricultural development.
3. **Developing Solutions to Complex Problems:** Research output equally helps to develop solutions to complex problems that are facing Nigeria. It has helped to build capacity for sustainable development by training researchers, policymakers, and other stakeholders (Jegade, 2023). The Nigerian government has established many research institutions and training programs to develop new methods for waste management, agricultural production, and water purification with the goal of supporting sustainable development. This doubt will encourage evidence-based decision-making at all levels of government and fosters transparency and accountability in the policy process.
4. **Socio-economic Development:** Research output also contributes to the design of social policies that address issues like healthcare, education, and social welfare. It aids in understanding demographic trends, gender disparities, and inequalities, helping to design policies that promote inclusivity and social equity (Ojo and Adeyemi, 2022). Adesina and Okeke (2022) asserted that research output on social welfare helps to understand

poverty dynamics to make informed social safety net policies aimed at poverty reduction and improving the welfare of vulnerable populations. As for education, research output helps make informed policies on curriculum development, teacher training, and access to quality education leading to quality human capital development. It helps to create policies that focus on skill-building and workforce development (Afolabi and Adedeji, 2022). Also, the output of the research helps in assessing the economic impact of policies, projects, and investments. Jegede (2022) opined that it aids in the identification of economic growth opportunities, resource allocation, and strategies for poverty reduction. Research in the areas of agriculture, industry, and trade can inform policies that promote economic diversification reduce dependency on oil revenue and consequently reduce the problem of unemployment in the country.

**5. Infrastructure and Urban Planning:** Research output on infrastructure needs and urbanization trends informs urban planning on development policies. It helps to create sustainable and resilient cities by addressing issues like housing, transportation, and access to basic services.

**6. Healthcare and Disease Control:** Medical and health research output is vital also for developing strategies to combat diseases, improve healthcare systems, and promote public health. Thus, it helps in the allocation of resources to healthcare infrastructure and the development of effective healthcare policies.

**7. Technology and Innovation:** Research output in science and technology informs policies related to innovation, research and development (R&D) funding, and technology transfer. This can be achieved through collaborative research with international partners and institutions that allow Nigeria to access global expertise, resources, and best practices, contributing to sustainable development. Hence, the output of the research will promote technological advancement and enhance Nigeria's competitiveness in the global market.

### **The Role of Research Output in Addressing the Challenges of Public Policy Process and Sustainable Development in Nigeria.**

The challenges of the public policy process and sustainable development in Nigeria are complex and multifaceted. Research outputs play a crucial role in addressing these challenges by providing evidence-based insights and recommendations. Adebayo and Azeez (2022) examined the role of research output in addressing the challenges of public policy and sustainable development in Nigeria. In their view, these roles include the following:

**1. Data and Evidence Generation:** Even when research produces evidence-based recommendations, there may be a gap between policy formulation and implementation due to bureaucratic challenges, corruption, or lack of political will. Ogunlade and Arowojolu, (2021) argued that sometimes, political interests override evidence-based policymaking, leading to sub-optimal policy decisions. Afolabi and Adedeji (2022) also stated that the research outputs contribute significantly to data and evidence generation, which is vital for effective policy formulation and implementation, and it helps policymakers understand the current state of various sectors, identify trends, and assess the impact of existing policies.

**2. Policy Formulation:** Sustainable development often requires long-term planning and commitment, but political cycles and short-term priorities can hinder sustained efforts. Inaccurate or incomplete data and the lack of a robust data infrastructure can compromise the quality and reliability of research findings. Research outputs provide valuable information and analysis that can guide the development of sound policies. They can identify

gaps and opportunities in different areas of sustainable development, leading to better-targeted policies.

**3. Policy Evaluation:** Research output helps in the evaluation of existing policies and programmes. Through impact assessments and evaluations, research outputs can inform policymakers about the effectiveness of their initiatives, allowing for adjustments and improvements.

**4. Capacity Building:** Many research institutions and universities in Nigeria face capacity constraints in terms of skilled researchers, equipment, and facilities, which can impede research quality. Afolabi and Adedeji (2022) stated that Nigeria's research capacity is relatively weak due to several factors, including a lack of qualified researchers, poor infrastructure, and a shortage of funding. Not only that, but insufficient funding for research has also hindered the generation of relevant data and evidence, limiting the impact of research outputs on policymaking (Jegade, 2023). Hence, the output of the research activities can enhance the capacity of government agencies, think tanks, and universities to engage in evidence-based policymaking. This, in turn, will strengthen the overall policy process in Nigeria.

**5. Public Awareness:** Research findings are not always effectively communicated to policymakers, and there is also the need for better dissemination strategies to ensure their uptake. Afolabi and Adedeji (2022) observed that there is often a lack of communication between researchers and policymakers in Nigeria. This can make it difficult for policymakers to access and use research findings. The government should improve communication between researchers and policymakers. This can be done by creating platforms for researchers and policymakers to interact, and by providing training for policymakers on how to use research findings (Jegade, 2022). The outputs, no doubt, can help raise public awareness and understanding of key sustainable development issues. When findings are communicated effectively, they can mobilize public support and participation in policymaking processes.

**6. International Collaboration:** Research output fosters international collaborations and partnerships, allowing Nigeria to tap into global knowledge networks and benefit from international experiences in sustainable development (Ojo and Adeyemi, 2022). Collaborative research projects involving Nigerian institutions and international partners can bring in external expertise and resources, enriching the knowledge base and facilitating the adoption of global best practices.

It is instructive to note that addressing the challenges of public policy and sustainable development in Nigeria requires concerted efforts from various stakeholders, including government, academia, civil society, and international partners. It must be acknowledged based on the foregoing that the role of research outputs in this regard cannot be underestimated. Prioritizing research funding, improving data infrastructure, enhancing research capacity, and promoting a culture of evidence-based policymaking are essential steps in harnessing the full potential of research outputs for sustainable development in Nigeria. Additionally, fostering collaboration between researchers and policymakers can facilitate the translation of research findings into actionable policies.

### **Institutional Setting for Managing Research Outputs in Nigeria.**

The institutional setting for managing research outputs in Nigeria is complex and fragmented. Several different institutions are involved in managing research outputs, including universities, research institutes, and government agencies. An attempt is made here to critically assess the effectiveness of these institutions in managing research outputs in Nigeria.

**National Assembly Research Service (NARS):** The NARS was established in 2004 to provide research support to the National Assembly. It has over 100 researchers and analysts, who conduct research on a variety of topics, including economic development, security, and social welfare (Adebayo *et al.*, 2023). The NARS also publishes many research reports and journals. NARS is the primary institution responsible for managing research output within the Nigerian National Assembly (Jegade, 2023). It is a specialized unit established to assist lawmakers in making informed decisions by providing them with high-quality research, analysis, and information.

Managing research outputs in Nigeria, especially in the context of the National Assembly Research Service, involves various institutional settings and processes. The National Assembly Research Service (NARS) is tasked with providing research support to members of the National Assembly in Nigeria by identifying research priorities, facilitating collaboration between researchers, and disseminating research findings (Adeoti and Salawu, 2020). Jegede (2022), however, argued that the research quality assurance of NARS should have a system in place to ensure the quality and accuracy of research output. This may involve peer review processes, fact-checking, and adherence to research ethics. There is no doubt that periodic evaluations and assessments of NARS's performance can help maintain high standards.

Adesina and Okeke (2022) also highlighted the roles and responsibilities of the National Assembly Research Service (NARS) which include:

- a) **Research Support:** NARS research various legislative matters, policy issues, and other subjects of relevance to the National Assembly members.
- b) **Information Dissemination:** NARS disseminates research reports, policy briefs, and other informational materials to lawmakers to aid them in their legislative work.
- c) **Training and Capacity Building:** NARS may organize training sessions, workshops, and seminars to enhance the research skills of National Assembly members and their staff.
- d) **Database Management:** NARS should have robust data and information management systems in place to store, retrieve, and disseminate research output effectively. This can be actualised by maintaining a repository of research reports and other documents for easy access by legislators. Also, they must ensure that data security and confidentiality is crucial, particularly when dealing with sensitive legislative information.
- e) **Institutional Collaboration:** NARS also collaborates with other research institutions such as the National Research Council of Nigeria (NRCN), Nigerian Institute of Science and Technology (NIST), Nigerian Universities Commission (NUC) and universities within Nigeria to leverage their expertise and resources (Ogunlade and Arowojolu, 2021). The NRCN is a statutory body responsible for coordinating and promoting research in Nigeria and NIST is a research and development institute that conducts research in a variety of fields, including engineering, agriculture, and medicine. In the same vein, NUC is responsible for the accreditation of universities in Nigeria as they also play a role in promoting research in universities (Adebayo and Azeez, 2022). This collaboration can lead to more comprehensive and well-informed research outputs.
- f) **Budgetary Support:** Adequate budgetary allocation is essential for the effective functioning of NARS. It needs funding for research activities, staff salaries, capacity building, and the maintenance of research databases.

- g) **Policy Advocacy:** NARS can also play an important role in advocating for evidence-based policymaking within the National Assembly, emphasizing the importance of utilizing research output in legislative decision-making.
- h) **Public Engagement:** NARS may also engage with the public, civil society organizations, and the media to disseminate research findings, promote transparency, and encourage public input in the legislative process.
- i) **Legislative Oversight:** The National Assembly itself should be able to exercise oversight over NARS to ensure that it fulfils its mandate effectively and efficiently.

Thus, managing research output within the National Assembly Research Service in Nigeria involves a structured institutional framework, collaboration with other research institutions, adherence to research quality standards, effective data and information management, budgetary support, and advocacy for evidence-based policymaking. This ensures that lawmakers have access to accurate and timely research to inform their legislative decisions.

**National Research Foundation of Nigeria (NRF):** The National Research Foundation of Nigeria is a government agency established to promote and coordinate research activities in Nigeria. It is tasked with funding research projects and initiatives across various disciplines (Adesina & Ogunsanwo, 2022). NRF supports research through grants, scholarships, and funding for both basic and applied research. It plays a vital role in facilitating research activities by providing financial support to researchers and institutions.

**Public-private partnerships between research institutions and government agencies:** Nigeria has numerous universities and research institutions, both public and private that conduct research in various fields. These institutions often receive funding from the government and external sources to carry out research projects (Adeoti and Salawu, 2020). Universities also have research offices and departments responsible for managing and coordinating research activities, including research output, publications, and collaboration with other institutions (Ojo and Adeyemi, 2022). Also, various government ministries and agencies in Nigeria have research units or departments dedicated to specific sectors, such as agriculture, health, education, and technology. These entities conduct research to address sector-specific challenges and improve policymaking (Jegede, 2022). The findings of research conducted by government agencies can contribute to the country's development and are often published as reports or policy documents. Adebayo and Azeez (2022) asserted that efforts have been made to promote open access to research findings in Nigeria. This includes initiatives to encourage researchers to publish in open-access journals and repositories to make research output more accessible to the public. Lastly, Nigeria may need to invest more in research and development, strengthen research institutions, and promote a culture of research excellence. Additionally, improving access to research findings and promoting interdisciplinary collaboration can contribute to the growth of the research ecosystem in the country.

## METHODOLOGY

The study examined the role of research output on public policy and sustainable development in Nigeria. The study employed the interpretivism philosophy and a qualitative approach in data collection and analysis. An exploratory research design was considered appropriate because of its flexibility to consider many different

aspects of the phenomenon. Similarly, newspaper reports and opinions were content analyzed as the study adhered to the qualitative model of social research, which included textbooks, journals, articles, newspapers, and other publications. Multiple secondary sources were used to reduce the risk of error and improve the study's reliability and validity.

### **Discussion of Findings**

The study examined the role of research output on public policy and sustainable development in Nigeria. It revealed that for the Nigerian government to achieve progressive strides in research output that will lead to sustainable development, the role of the National Assembly Research Service (NARS) and the National Research Foundation of Nigeria (NRF) should go beyond research support for members of parliament. These institutions must be able to integrate and collaborate with other research institutions in the country to be able to analyse policy options and give evidence-based information and analysis to Nigerian lawmakers to guide them in the decision-making process. Also, these institutions must play a pivotal role in facilitating public-private partnerships (PPPs) between research institutions and government agencies. They must be able to organise conferences and workshops that bring together scholars and politicians to discuss potential PPPs that will promote sustainable development in health, education, transportation, and other social services. This can help in the funding of joint research initiatives between universities and government agencies, as well as offer grants to private companies that are collaborating with research institutions. The findings of the study reflect the analytical data analyses based on the data gathered from the extant literature. Thus, the above finding is in line with the views of Adesina and Okeke (2022), Jegede (2023), as well as Ojo and Adeyemi (2022) on public policy and sustainable development in Nigeria: the policy gap and action dilemma. They argued that research and innovation are for the people, and the need to democratise them for prosperity is crucial for sustainable development. This can be achieved through funding and by building tech and innovation parks by the government and universities via the sovereign wealth fund and research grants from internal and external donors. This viewpoint is consistent with the research findings of the study.

### **Conclusion and Recommendations**

The study concludes that there has been a growing emphasis on research in recent years in Nigeria as the government has established several research institutes and universities. The government has also increased funding, although this has not led to a significant increase in research outputs in Nigeria. Based on this conclusion, it is recommended that research outputs should be communicated effectively to policymakers, communities, and the public in accessible and relevant formats. Also, there is the need to establish evidence-informed policymaking practices that will institutionalise mechanisms for incorporating evidence into policy decisions at all stages of the policy cycle. Researchers may also actively interact with policymakers, communities, and the media to amplify the impact of their findings, as well as promote transparency and accountability that can foster open access to research data and policy deliberations to strengthen public confidence, trust, and participation. Nigeria can establish a more conducive environment for research to generate evidence-based policies that promote sustainable development and enhance the lives of its population by addressing the challenges and implementing these strategies.

In addition, there should be collaboration between researchers and policymakers, data accessibility, and the willingness of policymakers to engage with research findings. It is therefore crucial to create mechanisms that promote the use of research in policy formulation, implementation, and evaluation to maximise its impact on sustainable development in Nigeria.

## **PUBLIC POLICY AND SUSTAINABLE DEVELOPMENT: ASSESSMENT OF THE ROLES OF RESEARCH OUTPUT IN NIGERIA.**

The study has a lot of merit in its objectives. There is a need to look through for minor corrections that may derail the original intentions of the author. The research output in my opinion should be presented in reported tense.

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## SESSION TWO: FOCUS ON PROSPERITY (SDG 7, 8, 9, 10,11, and 12)

### 12. Cultural Heritage: Enabler For Actualization of Sustainable Development Goals: A Case of Ife Cultural Heritages.

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#### Abstract

Our cultural heritage defines who we are and how we express ourselves. It functions as a fundamental basis for individual and collective identity formation, as well as a catalyst for the generation of novel ideas and imaginative expression across diverse populations. The significance of culture in fostering human development lies in its ability to provide enduring solutions to both local and global challenges. The relationship between economic growth and cultural heritage is significant since it contributes to generating income and is esteemed due to its potential economic value. Cultural heritage centers play a crucial role in fostering the expansion of urban areas and promoting the advancement of sustainable tourist practices. The advantages of cultural heritage encompass the generation of employment opportunities, capital investment, and the provision of environmentally sustainable alternatives to corporate frameworks that fail to contribute to environmental betterment. The heritage should be protected and managed cautiously, as they possess the potential to serve as catalysts and enablers in achieving the Sustainable Development Goals (SDGs) by the year 2030. The Olojo Festival, which takes place in Ile-Ife, Nigeria, significantly contributes to the economic growth of both the historic city and the surrounding state. This study focuses on the impact of the Olojo cultural festival celebration on national development and the achievement of the Sustainable Development Goals by 2030. This study is grounded in the theoretical frameworks of Symbolic Interactionism and Restoration Theory, which emphasize the importance of approaching the monument to be restored with a deep sense of humility. The recommendation ultimately suggests that cultural heritage ought to be utilized as a source of inspiration for individuals and communities, motivating them to actively pursue sustainable development for the collective well-being of present and future generations.

**Keywords:** *Sustainable Development, Cultural Heritage, Olojo Festival, Ile Ife.*

#### Introduction

The cultural background of individuals plays a significant role in shaping their identity and influencing their modes of self-expression. It functions as a fundamental basis for individual identity, innovation, and artistic expression for all individuals. The significance of culture in human development lies in its provision of enduring solutions to both local and global challenges. The economic growth of a society is contingent upon its cultural heritage, as it generates revenue and is esteemed due to its potential economic value. In Ile Ife which is widely regarded as the ancestral homeland of the Yoruba people, its profound significance is attributed to both its rich natural and cultural diversity. The Ife cultural heritage aligns with the objectives of the United Nations' Vision 2030 such as Olojo Cultural Festival, Aje Cultural Festival, the Oranmiyan Cultural Heritage Site, Moremi and Oduduwa Cultural Site, among others. The insufficient emphasis placed on the sector in the ancient city makes it difficult to achieve the SDG agenda 2030 of the community. Several efforts are being made by the Ooni of Ife and other cultural stakeholders in the historic city to actualize the goals. The efforts have assisted in generating jobs in the community, thereby addressing SDG 1 (No Poverty) and SDG 8 (Decent Jobs and Economic Growth). Based

on the findings of this work, it was deduced that Ife Cultural heritage site and festivals have the potential to contribute to the achievement of the SDGs. Relevant stakeholders should collectively establish a conducive environment for the preservation and promotion of the Cultural heritage sector and the inclusion of the sector as a distinct objective within the SDGs is imperative.

Fatomilola (2017), opined that each person possesses memories, whether positive or negative, that serve as the fundamental components of their own Cultural legacy. Similarly, communities, regions, or nations make the deliberate decision to safeguard a portion of their historical inheritance and their cultural heritage. UNESCO (2001), individuals have consistently exhibited a fundamental inclination to draw upon their historical background as a means of safeguarding the perpetuation of a shared identity that undergoes transformation. Stating further that people's cultural legacy is a communal property that tells the history of a people, a city, or a territory, and is handed from one generation to the next. Dauge's (2000), cultural heritage has a crucial role in enabling current generations to comprehend their historical context and effectively adapt to the continuous societal transformations. Dauge further asserts that cultural heritage serves as a stabilizing factor in an era characterized by rapid change. The significance of cultural heritage sustainable development has been extensively acknowledged and promoted by prominent international organizations such as the United Nations and UNESCO (ICOMOS 2011). Ansari and Khan (2020), says cultural heritage is a fundamental component of numerous old towns across the globe. Nevertheless, it consistently faces significant risks because of prevailing development demands. United Nations (2017), the importance of cultural heritage cannot be emphasized, as it serves as a fundamental cohesive element within a society. The corpus of knowledge reveals that it encompasses both tangible artefacts and intangible elements of a community or culture that have been inherited from preceding generations. They suggest further that if these elements are carefully preserved in the present subsequently, they can be transmitted to future generations which include historical architectural structures, landscapes, literary works, and artistic expressions. In addition, it encompasses intangible elements such as social behaviors, rituals, performing arts, oral traditions, festivals, Indigenous knowledge and practices related to environmentally sustainable living, traditional crafts, language, and natural heritage (UNESCO, 2020). The body added that culture and heritage have a significant role in shaping society, as humanity has always relied on historical knowledge to construct and enhance the current and forthcoming periods. UNESCO (2012), also revealed that the cultural and creative industries are experiencing significant growth in the global economy, with growth rates of 17.6% in the Middle East, 13.9% in Africa, 11.9% in South America, 9.7% in Asia, 6.9% in Oceania, and 4.3% in North and Central America. They opined further that investing in culture and creativity has demonstrated to be a highly effective strategy for revitalizing urban economies. In contemporary times, numerous cities, like Ile Ife in Osun State, Nigeria, have adopted the utilization of cultural institutions as strategic tools to enhance their reputation, foster both rural and urban growth, and entice visitors and investments.

Watene (2015), elaborates on the notion that the safeguarding of a community's cultural heritage necessitates more than just the preservation of physical artifacts; it also requires the active promotion of the associated creative practices and living culture. Fatomilola (2018), it is widely acknowledged that Ile Ife holds significant historical and scientific importance as the birthplace of human existence, supported by empirical evidence. He revealed that in Ile Ife, several cultural heritage activities align with the objectives of the United Nations' Sustainable Development Goals for the year 2030. These activities include the Olojo Cultural Festival,

Aje Cultural Festival, the Oranmiyan cultural heritage site, the Moremi Cultural Heritage Site, and the Oduduwa cultural site, among others. The Olojo festival is a significant cultural celebration that commemorates the initial emergence of dawn, afternoon, and night throughout the process of creation. Olafare (2022), informed that "Olojo" encompasses both a literal and figurative significance, denoting the possessor or controller of time. The annual commemoration of Olojo's festival holds great significance since it marks a complete cycle of the Oonirisha. He agrees with the day its appropriate position in the historical records. He proclaimed the Yoruba calendar. Over the last two decades, alongside charitable contributions, sponsorship has been acquired from private corporations, politicians, and governmental entities. The Ile Ife cultural festival is presently being positioned as a significant national event by diverse marketing consultants who are tasked with securing funding and issuing invites to esteemed guests. Eredumi (2020), the Cultural festival serves to support the local economy, aligning with the primary objective of SDG 2030. This event provides advantages to individuals from various social backgrounds both within and beyond the community. Moreover, it has emerged as a catalyst for the advancement of cultural tourism, thereby ensuring the long-term sustainability of Ile Ife city and the broader Osun State region. Undoubtedly, the diverse cultural heritage sites and festivals of Ile Ife possess numerous elements that have the potential to facilitate the realization of the Sustainable Development Goals (SDG) 2030 agenda, provided they are effectively utilized. The engagement in cultural heritage activities serves to advance the Sustainable Development Goals (SDGs), including but not limited to Goal 4, which focuses on ensuring inclusive and equitable quality education for all; Goal 8, which aims to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all; Goal 12, which emphasizes responsible consumption and production patterns; and Goal 13, which addresses the urgent need to combat climate change and its impacts. The preservation of cultural heritage assets in Ile Ife has the potential to generate employment possibilities within the local communities, so it contributes to economic growth and provides decent work for the unemployed youth in the area, aligning with the objectives of Goal 8. The sustainable management of these sites has been noted to have the potential to foster responsible consumption and production, thereby aligning with Goal 12. Additionally, efforts to reduce waste and promote sustainable practices can also contribute to climate action, in line with Goal 13. This is because these sites can function as carbon sinks and facilitate the conservation of biodiversity.

### **Statement of the Problem**

The importance of cultural heritage in accomplishing the Sustainable Development Goals of the UN is becoming more widely recognized (UNESCO 2020). However, research is still ongoing to determine how various forms of heritage—whether tangible, intangible, historical, or modern—can directly support the SDGs (Africa World Press 2022). SDGs including Quality Education (SDG 4), Decent Work and Economic Growth (SDG 8), Sustainable Cities and Communities (SDG 11), and Reduced Inequalities (SDG 10) frequently connect with cultural heritage (UNESCO 2020). However, it is frequently forgotten how specifically African cultural heritages contribute to the accomplishment of these objectives.

Ile-Ife, a significant cultural site in Nigeria and Africa, is recognized for its profound history, especially as the spiritual and historical capital of the Yoruba people. While numerous studies have investigated Ife's importance in archaeology, history, and cultural influence, its contribution to modern sustainable development,

particularly regarding the attainment of Sustainable Development Goals (SDGs), has not been thoroughly examined in current literature (Adetayo 2020). The increasing body of scholarship on cultural heritage as a facilitator for Sustainable Development Goals (SDGs) predominantly emphasizes generic or global case studies, including those from Europe, Asia, or indigenous groups (Cambridge 2023). Research concentrating on Ife as a case study is limited, necessitating greater emphasis on how this historically significant place in Africa contributes to the Sustainable Development Goals (Adetayo 2020).

Moreover, whereas physical heritage (such as monuments and artifacts) frequently prevails in discourse, intangible cultural heritage (including language, traditions, and festivals) within the framework of the Sustainable Development Goals remains inadequately examined (The Cultural Economy of Tourism in Africa 2021). Ife possesses a rich array of intangible legacy, including oral traditions, indigenous knowledge, and artistic practices, which could significantly contribute to the achievement of the Sustainable Development Goals; yet, this dimension remains predominantly underexamined in contemporary literature (Elugbaju A, 2022).

The existing gap pertains to the insufficiently examined correlation between Ife's cultural legacy and certain Sustainable Development Goals (SDGs), emphasizing intangible heritage, community engagement, and contemporary preservation methodologies. Rectifying these deficiencies could enhance the academic discipline and provide pragmatic answers for utilizing Ife's cultural assets in sustainable development initiatives.

### **Research Questions**

- (1) Does the Ile Ife cultural heritage promote environmental sustainability through traditional knowledge and skills?
- (2). To what extent does the Ile Ife cultural heritage contribute to economic development?
- (3.) Does cultural heritage preserve and promote peace in society as outlined in the SDG Agenda 2030
- (4). Does the cultural heritage sector promote the SDG 2030 agenda?
- (5.) How effective does the Ile Ife Cultural Heritage use for the actualization of the Sustainable Development Goals 2030?

### **Literature Review**

UNESCO (2020), the intersection of culture and sustainability holds significant relevance in contemporary society, characterized by its dynamic and ever-evolving nature. Culture has a pivotal role in fostering connections among diverse interest groups and making significant contributions to the advancement of society, as well as the development of individual and collective identities, and the promotion of inclusivity. It serves as a helpful complement to the three fundamental dimensions of sustainability, namely the economic, social, and environmental aspects. The esteemed institution acknowledged additionally that the interconnection between culture, art, and sustainable development might be delineated through various perspectives, yet they all concur with the pivotal part that culture assumes. Babarinsa (2021), cultural heritage, refers to the collection of tangible artefacts and intangible qualities that pertain to a particular group or civilization. These elements are inherited from preceding generations, actively conserved in the present, and transmitted to future generations for their advantage. Falola (2019), argued that the creative endeavors of individuals result in the formation of cultural legacies, which are then conserved and transmitted through oral traditions or tangible records across numerous

generations of human societies. The academic scholar proceeded to assert that Nigeria boasts a diverse array of cultural heritage sites and festivals, encompassing notable examples such as the Eyo festivals in Lagos, the majestic Ooni Palace, the artistry of Calabash carving, and the esteemed Alaafin Palace in Oyo. Additionally, the scholar highlighted the Ekpo Masquerade in Akwa Ibom, the Igue Festival in Edo, the Mmanwu Festival in Enugu, the Durba in Kaduna, the Kano City Walls, and the Agungun Fish Festival in Sokoto as further manifestations of Nigeria's rich cultural tapestry.

Nordon (2020), it is emphasized that cultural festival activities should possess sustainability in terms of resource utilization and energy usage. The professor emphasized the inclusion of culture inside the ecological pillar, as it serves as a fundamental component of the sustainability framework. Olafare (2022), the Cultural festivals in Nigeria serve as a means to promote the Sustainable Development Goals (SDGs) agenda. These festivals exemplify the SDGs through the showcasing of positive examples, thereby inspiring others. The individual expressed the viewpoint that culture can be seen as the fundamental underpinning of all human endeavors, thus emphasizing its significance in achieving sustainable development. The individual also highlighted the Yoruba Cultural legacy as an example that endeavors to exemplify this notion, while not receiving adequate promotion comparable to that of Cuba and Brazil.

In the word of Ogunwusi (2022), the utilization of cultural heritage sectors in the celebration of cultural festivals has significant implications for national development. The esteemed monarch proposed that the incorporation of our culture, traditions, and legacy into every sociocultural advancement of our nation holds significant importance, particularly for the global community and the black population. He expressed the viewpoint that the culture of a nation or specific race cannot expand or adopt new cultural elements, but rather must be conserved and maintained sustainably for future generations to benefit from, ultimately contributing to the improvement of society. He further stated that the culture of Africa, particularly the Yoruba culture, provides us with optimism for a more inclusive and heterogeneous nation. The speaker emphasizes the necessity of passionate and resolute guidance for our culture to effectively propel our nation towards economic revitalization and national prosperity. The individual highlighted that culture possesses the principles, significance, and inherent benefits to facilitate a return to historical practices of equitable wealth allocation and to transform urban areas into hubs of trade and affluence, aligning with the central objectives of the United Nations' Sustainable Development mandate. Ogunwusi (2022) emphasized the necessity of reforming our nation's governing structure, which has been in place for the past six decades, due to the systemic deficiencies and defective procedures it encompasses. Goldin (2019), the preservation and promotion of cultural heritage activities serve as an independent objective, while also contributing to the achievement of various Sustainable Development Goals. These goals encompass the promotion of gender equality, the establishment of safe and sustainable cities, the provision of decent work opportunities, the facilitation of economic growth, and the fostering of inclusive and peaceful societies, among others. The scholar posits that the successful and culturally sensitive implementation of development aims might yield indirect benefits for culture.

Culture is mandated to play a substantial part within the framework of the United Nations' agenda for the year 2030, specifically under Sustainable Development Goal 11. To ensure the security, resilience, and sustainability of human settlements and cities, it is imperative to foster inclusive. UNESCO (2020), objective 11 of the Sustainable Development Goals emphasizes the need for intensified endeavors to safeguard and sustain



global natural and cultural resources. In Ile Ife, located in the Southwest region of Nigeria, it serves as the ancestral home of the Yoruba people. This region, along with the entirety of Nigeria and various other parts of the globe, has witnessed rapid growth in the tourism industry. Notably, cultural tourism accounts for 40% of the total revenue earned from tourist activities (Ogunwusi, 2022). Upon critical assessment of this statement, it can be argued that these initiatives provide significant advantages across all Sustainable Development Goals (SDGs), with particular emphasis on SDG 8, which pertains to "Decent work and economic growth," as well as SDG 11, which focuses on "Sustainable cities and communities."

Awolalu and Dopemu (2019), it may argue that most cultural holidays in Africa include a religious nature due to their association with certain divinities, spirits, or ancestors. Within the Yorùbá cultural context, it is observed that each deity is linked to an annual cultural event known as "Odún." The term "Odún" possesses the additional connotation of denoting a year, and when employed in the context of festivals, it signifies an "annual festival". It can be observed that the Yorùbá community celebrates significant cultural events on an annual basis. Olafare (2022), the cultural heritage of Ife, a city situated in the southwestern region of Nigeria, presents an abundant source of exploration. Olafare further asserts that this ancient town is deeply rooted in historical significance and enveloped in enigmatic qualities, thereby providing a captivating window into the intricate fabric of African culture. The speaker elaborates on the cultural legacy of Ife, highlighting its ancient sculptures, exquisite artworks, vivid festivals, and oral traditions. They emphasize that these elements serve as evidence of the remarkable inventiveness and creativity exhibited by the people of Ife. Ilé-Ifè, a town renowned as the city of 201 gods according to J. K. Olupona, has a variety of cultural festivals. These include the Edi festival, Qbátálá festival, Qbameri festival, Qsàrà festival, Qrànmiyàn festival, and Qlọjọ festival. The Qlọjọ festival holds the distinction of being the most prominent among all other festivals.

### **The Historical Significance of Ile Ife**

Fashola (2019), Examining the abundant cultural legacy of Ife, emphasized that one cannot overlook the profound importance of the historical kingdom that flourished in this area. He further xrayed that the Kingdom of Ife, situated in contemporary Nigeria, occupies a significant position in African history and is often recognized as the cradle of Yoruba civilization. Ife, with a history spanning more than a millennium, has significantly influenced the cultural terrain of West Africa. Horton (1979) stated that when examining the cultural history of Ife, one cannot disregard the importance of sacred locations and ceremonies in forming the spiritual customs of this historic African culture. The scholar informed further that revered locations function as tangible representations of the metaphysical domain, serving as intermediaries connecting the mortal and celestial realms. Oseghale et al (2009), the inhabitants of Ife hold great reverence for these sites, as they attribute vast power to them and consider them crucial for the preservation of harmony and equilibrium in their existence. Craddock (2013) noted that the cultural heritage of Ife, characterized by its elaborate sculptures, mythological narratives, and deeply ingrained customs, exerts a lasting influence on contemporary manifestations within the African continent.

### **How Ife cultural History Connects**

**The Origins of Legends:** Following Yoruba mythology, the establishment of Ife is attributed to Oduduwa, a

mythological entity widely regarded as the ancestral originator of the Yoruba ethnic group. According to popular folklore, Oduduwa is believed to have descended from the celestial realm using a chain, subsequently establishing his dominion in the region of Ife.

**Artistic Excellence:** An outstanding characteristic of Ife's cultural history resides in its noteworthy artistic accomplishments. The kingdom is widely recognized for its exceptional bronze and terracotta sculptures, which are regarded as exemplary works of African art. The sculptures included in this collection portray human figures characterized by detailed features, so exemplifying the exceptional skill and workmanship demonstrated by the artisans of Ife.

**Social Organization:** In addition to serving as a hub for artistic expression, Ife has a sophisticated social structure, indicating a well-organized community. The governance of the kingdom was entrusted to a series of monarchs referred to as Oonis, who had dual power in both political and religious domains.

**Cultural sharing:** The impact of Ife transcended its territorial boundaries through the facilitation of trade and the sharing of cultural practices. The kingdom functioned as a central point for commercial activities, drawing traders from various regions of Africa and other distant locations.

### **The Influence of Ife's Cultural Heritage on Contemporary Africa**

**1. The Influence of Ife's Cultural Heritage on Fashion:** The cultural legacy of Ife has significantly impacted the realm of fashion. The traditional dress of the Yoruba people is notable for its brilliant color palette and elaborate patterns, which are deeply influenced by the cultural aesthetics of Ife.

**2. Musical Rhythms and Melodies:** The rhythmic patterns and melodic compositions originating from Ife's cultural history persistently resonate within contemporary African music. The impact of traditional Yoruba drumming, characterized by intricate polyrhythms and dynamic live presentations, has permeated several musical genres including Afrobeat, highlife, and juju music

### **The Ile Ife Cultural Calendar**

Traditional festivals hold great importance in commemorating the liveliness of Ife's cultural timetable. The festivals not only provide an occasion for celebration and enjoyment, but also act as a mechanism for the preservation and exhibition of the cultural legacy of the Ife community. These festivals provide an insight into the customs, ideologies, and principles that have been transmitted across successive generations, through a range of intricate rituals and vibrant parades.

**1. Cultural Significance:** The traditional festivals of Ife are of great cultural importance to its inhabitants. These events allow participants the chance to reestablish a connection with their cultural heritage, demonstrating reverence towards their forebears and divine entities. The celebrations frequently encompass ceremonial practices, traditional dances, and artistic presentations that are firmly grounded in the historical and mythological heritage of Ife.

**2. Community Cohesion:** Festivals serve as a platform for individuals from many backgrounds to converge, thereby cultivating a collective consciousness and building a sense of communal solidarity. During these festive occasions, folks gather in communal settings to engage in the exchange of narratives, amusement, and elation. The Olojo Festival serves as a significant attraction, drawing a multitude of attendees from both domestic and international locations, who converge in Ife to partake in the spectacle of this big occasion. The increase in population not only enhances the economic performance of local enterprises but also fosters the development of

social connections among participants.

**3. Economic Significance:** Traditional festivals exert a substantial influence on the economic landscape of Ife and its environs. During these events, local artisans and craftsmen capitalize on this occasion to exhibit their expertise by producing elaborate artworks, sculptures, and traditional costumes, which are subsequently marketed and sold. In addition, food merchants establish stalls that provide customary delights, including pounded yam accompanied by egusi soup or amala served with ewedu soup. The occurrence of festivals attracts a significant number of tourists, so stimulating the local economy by generating higher sales and greater revenue from tourism.

**4. The Preservation of Cultural legacy:** Traditional festivals play a vital role in the conservation and transmission of Ife's cultural legacy to forthcoming generations. During these celebratory events, the younger generation is provided with opportunities to familiarize themselves with the customs and traditions passed down by their forebears, through engaging in performances, rituals, and storytelling.

**5. Tourism Attraction:** The traditional festivals of Ife have garnered significant acclaim as prominent tourism destinations, attracting a diverse range of visitors from all parts of the globe. The Olojo Festival, for instance, has been officially recognized and inscribed on the UNESCO Intangible Cultural Heritage list.



**Figure 1: The Ooni of Ife Oba Adeyeye Enitan Ogunwusi with the traditional Aare crown while offering prayer for sustainable Peace, Economic Prosperity and Development in Ife land and Nigeria at large.**  
**Source: Field Data, 2023**



**Figure 2: The Olojo Festival Aare Crown. Source: Field Data 2023**



**Figure 3: The Ooni of Ife Palace, Source: Ooni Palace, Ile Ife, Osun State, 2023.**



**Figure 4: Ori Olokun Ile Ife, Source: Field Data, 2023**



**Figure 5: Ile Ife Moremi Status, Source: Ooni Palace Ile Ife, Osun State, 2023.**  
**Theoretical framework**

## **Symbolic Interactionism Theory**

Symbolic interactionism represents the sociological framework that primarily focuses on the interpersonal interactions and cultural significance shared among individuals within a given community. The analysis is regarded as a micro-level examination. Instead of examining the disparities in access between persons of different socioeconomic backgrounds, interactionists perceive culture as a product of social interactions and the subjective interpretations of individuals regarding one another's behaviors. From this standpoint, individuals sustain and transmit cultural practices. Symbolic meanings are attributed to every item and action, and language functions as a medium through which individuals can convey and share their interpretations of these meanings with others. Symbolic interactionists regard culture as a dynamic and fluid phenomenon, as its nature is contingent upon the interpretation of meaning and the interactions between persons in the process of transferring these meanings. Interactionist research examines the transformations that occur in language.

## **The Restoration Theory**

The Restoration Theory posits the necessity of approaching the monument to be restored with a deep sense of humility, focusing solely on the preservation of the structure and exhibiting an exceptional level of meticulousness in comprehending the original designers' objectives during the creative process. Hence, it is imperative for the restoration endeavor to adhere to the essence of the monument, thereby ensuring methodological accuracy and effective project management. The approach proposed by Annoni (1882-1954) is intriguing in its emphasis on placing the monuments themselves at the focal point of restoration projects. Annoni suggests that these monuments possess the ability to serve as the primary source for interpreting and guiding appropriate interventions.

## **Methods**

The study employed a survey research design. The survey methodology is the most suitable research design for this study due to its ability to effectively sample and gather respondents' opinions. The population of Ife in the year 2023 is 409,274. The population estimates and projections shown above are derived from the most recent edition of the United Nations World Urbanization Prospects. The figures provided pertain to the urban agglomeration of Ife, encompassing not only the population of Ife itself but also the surrounding suburban districts. Most of the population in Osun State is mostly engaged in agricultural activities and has a strong inclination towards entrepreneurial pursuits. Nevertheless, a considerable proportion of individuals employed in the civil and public sectors persists. The cultural heritage sector distinguishes itself from other sectors utilized by citizens within the metropolis. The sample size of 384 was determined using the Wimmer and Dominick online sample size calculator, with a confidence level of 95% and an error limit of 5%. The study employed a questionnaire designed with a combination of dichotomous and Likert scale formats to gather data. The questionnaire was distributed through face-to-face interactions, utilising the multistage sampling technique, among the residents of Ile Ife Metropolis in Osun State. The multistage sample technique was adopted for the research work because it helps to reduce costs and time, and it was also used to simplify data collection for the work. During the initial phase, Ile Ife, a conglomerate, underwent division into three distinct regions, specifically Ife Central, Ife East, and Ife South. For the second stage, two communities were deliberately selected from each local government area based on their notable literacy rates and significant access percentages to cultural heritage sites in the Ife zone. The selected areas are Ilare, Moore, Okerewe, Enuwa, Ifetedo, and Olode, respectively.

During the third stage of the study, the researchers selected six communities and administered the questionnaire to them in a non-proportional manner, with each community receiving an equal number of questionnaires (384/6 = 64). Employing a deliberate approach, the researchers distributed 64 copies of the questionnaire to respondents within these communities. To conduct data analysis, basic percentages and mean analysis techniques were utilized, and the results were presented in a tabular style to enhance clarity.

### **Data Presentation, Analysis and Result**

A total of 384 participants in Ile Ife administered the questionnaire, which served as the primary tool for data collection in this study. The study achieved a return rate of 369 (96%), with 15 (4%) questionnaire copies remaining unreturned. Consequently, the data reported in this study is based on the 369 questionnaires that were returned. Based on the data shown in Table 1, it can be observed that most of the respondents, specifically 60%, agreed with the notion that the Ile Ife cultural heritage effectively contributes to the promotion of environmental sustainability employing traditional knowledge and skills. The findings indicate that a significant proportion of the respondents hold the view that the primary focus of mainstream Ile Ife cultural heritage festival sites is to prioritize the promotion of environmental sustainability in their programming.

The study of Table 2 indicated that 51% of the participants acknowledged, to a moderate degree, that the cultural history of Ile Ife contributes to the economic value within the community. This implies that a significant number of participants in the study expressed that the Ile Ife Cultural heritage, including festivals such as the Oranmiyan festival, Aje Festival, Moremi Festival, and the renowned Olojo Cultural Festival, serve as effective platforms for attaining the Sustainable Development Goals (SDGs) 1 (No poverty), 8 (Decent work and Economic Growth), 9 (Industry, Innovation and Infrastructures), and 11 (Sustainable Cities). This is achieved through the economic development facilitated by these cultural festivals in the region of Ile Ife and its surrounding areas. This statement implies that survey participants expressed consensus regarding the positive impact of the diverse cultural legacy of Ile Ife in advancing several Sustainable Development Goals (SDGs) through the use of new approaches during the annual cultural festival held in the town. The respondents expressed their disagreement with the idea that cultural heritage is not included in the pursuit of the economic development goals outlined in the Sustainable Development Goals (SDGs).

**Table 1 : Respondent responses on does the Ile Ife cultural heritage promote environmental sustainability through traditional knowledge and skills?**

<b>ITEMS</b>	<b>FREQUENCY</b>	<b>PERCENTAGE</b>
<b>YES</b>	<b>221</b>	<b>60%</b>
<b>NO</b>	<b>148</b>	<b>40%</b>
	-	-
<b>Total</b>	<b>369</b>	<b>100%</b>

Source, (field survey, 2023)

**Table 2. Respondent responses on what extent does the Ile Ife cultural heritage contribute to economic value?**

ITEMS	FREQUENCY	PERCENTAGE
Very High	36	10%
High	79	21%
Moderate	187	51%
Low	67	18%
Total	369	100 %

Source, (Field Survey 2023)

**Table 4: Respondent response on does the Ile Ife cultural heritage promotes SDG 2030 agenda through its contents.**

ITEMS	FREQUENCY	PERCENTAGE
Strongly Agree	147	40%
Agree	38	10%
Disagree	132	36%
Strongly Disagree	52	14%
Total	369	100%

Source, (Field Survey, 2023)

**Table 5: Respondents' responses how effective does Ile Ife Cultural heritage be use for actualization of the Sustainable development goals 2030.**

ITEMS	FREQUENCY	PERCENTAGE
Very Effective	177	48%
Effective	55	16%
Moderate	95	26%
Not Effective	23	6%
Can't Say	19	5%
Total	369	100%

Source, (Fieldwork 2023)



From the data in Table 3, 46 % of the respondents agreed that cultural heritage protects and promotes peace in society as indicated in the SDG Agenda 2030. This suggests that a significant proportion of the participants hold the belief that the sector serves as an effective means of fostering peace and prosperity within society by facilitating intercommunity, town, or city relationships, which aligns with one of the key principles advocated by the United Nations.

Based on the findings shown in Table 4, it can be observed that 40% of the participants surveyed agreed with the notion that the cultural heritage of Ile Ife contributes to the advancement of the Sustainable Development Goals (SDGs) outlined in the 2030 agenda, as evidenced by the content associated with it. This indicates that a significant proportion of the participants in the survey hold the belief that the contents of the Ile Ife Cultural Heritage Festival have the potential to effectively contribute to the achievement of the sustainable development agenda for the year 2030. However, it is worth noting that 36% of the respondents express complete disagreement with this assertion, citing their exposure and experience with the societal challenges of underdevelopment in certain areas of the Ile Ife community. According to the findings presented in Table 5, the responses of the participants indicate the potential effectiveness of Ile Ife's Cultural heritage in contributing to the achievement of the Sustainable Development Goals by the year 2030. According to the respondent's feedback, it was found that 48% of them hold the view that the Ile Ife Cultural sector has a favorable opportunity for realizing the goals. This suggests that a significant number of respondents believe that the cultural heritage sectors in Ile Ife play a crucial role in achieving the Sustainable Development Goals (SDGs) by 2030 in Nigeria, provided that the policies of the United Nations and UNESCO consider the involvement of the Osun State and Nigerian government, as well as key stakeholders.

The findings indicate that the Ile Ife cultural festival, with an average participation rate of 56%, moderately contributes to the achievement of the Sustainable Development Goals (SDGs) Agenda 2030 among the population of Ile Ife City. This finding aligns with the research conducted by Nomishan et al. (2020), which demonstrated that respondents derive a moderate level of benefit from this phenomenon due to its ability to attract both internal and external investments, generate employment opportunities through increased cultural tourism, enhance infrastructure, and foster a sense of patriotism among community members. Nevertheless, despite the considerable advantages associated with the effective administration of Cultural Heritage for the local communities, future generations, and the overall socioeconomic welfare of society, this valuable resource has encountered several anthropogenic challenges on a global scale. According to the study conducted by Yılmaz and El-Gamil (2018), the diverse cultural legacy of Ile Ife contributes to the promotion of love, unity, commitment, and patriotism among its members, as well as the residents of Nigeria as a whole. This aligns with the objectives of Sustainable Development Goal 16 (SDG 16) which focuses on peace, justice, and strong institutions. Temgu *et al.* (2023), it appears that the multitude of cultural heritage materials in Ile Ife not only contribute to the promotion of national cohesion and intercultural dialogue but also have the potential to be utilized for tourism to facilitate sustainable development in Nigeria. However, the preservation of the captivating advantages stemming from Ile Ife's culturally rich legacy is currently at risk due to its inadequate inclusion in the policies of the SDG 2030 goal.

The Numerous Ile Ife Cultural heritage sites and festivals have the potential to significantly contribute to societal development, hence serving as a promising route for the realization of the SDG 2030 agenda. However,

for this sector to effectively harness its potential, the Nigerian Government and the United Nations must provide proper management and support. The absence of government commitment and the insufficient incorporation of culture as a goal has hindered the successful attainment of the SDG agenda in Nigeria, specifically in the southwestern region. Consequently, the shortcomings experienced during the implementation of the MDG initiatives in this area will likely persist, despite the broader scope of the SDG 2030 agenda. The findings suggest that the government, as well as other relevant entities and stakeholders responsible for advancing the cultural heritage sector, specifically with the numerous cultural heritage sites in Ile Ife, have not fully committed to the efforts aimed at promoting Ife's cultural heritage for the achievement of the sustainable development goals by 2030. The concept of agenda setting plays a crucial role in shaping public perception and directing attention towards specific issues. By strategically establishing the agenda and emphasizing the significance of Ile Ife's cultural heritage, individuals will be compelled to prioritize and contemplate its value.

Consequently, the cultural heritage's relevance will gain widespread recognition, catalyzing achieving the vision outlined in the Sustainable Development Goals (SDGs) by 2030. Moreover, this approach can help safeguard the cultural sector from the imminent threat of extinction. This observation aligns with the research conducted by Widodo (2023), which asserts that the recognition of World Heritage sites as significant entities contributes to the attainment of many Sustainable Development Goals (SDGs), particularly Goal 11. Goal 11 emphasizes the importance of creating inclusive, safe, resilient, and sustainable cities and human settlements. The researcher emphasized that World Heritage sites, including Ile Ife, have the potential to contribute significantly to the attainment of Goal 11 by facilitating sustainable tourism, safeguarding cultural heritage, and fostering economic growth that positively impacts local populations. Furthermore, the preservation of these sites serves to enhance the promotion of education and raise awareness regarding the significance of cultural heritage, as well as the imperative to save it for the benefit of future generations. In a similar vein, Centre's study (n.d.-e) in 2023 demonstrated a correlation between the Cultural Heritage status and various other Sustainable Development Goals (SDGs), including Goal 4 on quality education, Goal 8 concerning decent work and economic growth, Goal 12 focusing on responsible consumption and production, and Goal 13 addressing climate action.

Preservation of the Ile Ife Cultural Heritage sites have the potential to generate employment possibilities within the Ile Ife communities, making a significant contribution to both economic growth and the promotion of decent work, in alignment with Goal 8. The promotion of responsible consumption and production (Goal 12) can be facilitated by the sustainable management of these locations, thereby fostering the adoption of sustainable practices and waste reduction. Ultimately, the preservation of these places has the potential to make a significant contribution to climate action, specifically Goal 13. This is due to their ability to function as carbon sinks, effectively sequestering carbon dioxide, and their capacity to facilitate the conservation of biodiversity.

In addition, the study conducted by Sridharan & Sharma (2023), revealed that cultural legacy, encompassing both tangible and intangible aspects, exerts a significant impact on the progress and evolution of society across various dimensions. The significance of heritage protection is underscored by the presence of numerous elements. It has been seen that the preservation of the historic environment yields considerable benefits to local economies, particularly in terms of tourism, and serves as an effective means of attracting external investments. The authors emphasize the importance of adaptive reuse of historical structures in the promotion of

sustainable communities. This is primarily achieved by significantly reducing the carbon footprint associated with new construction projects and by preserving cultural heritage. Additionally, adaptive reuse contributes to enhanced social inclusion within these communities. The authors assert that the cultural heritage sector possesses valuable knowledge that can contribute to society's efforts in mitigating and adapting to climate change. This expertise encompasses various areas, including water and climate management as well as the carbon sequestration potential of forests on a global scale. The conclusion suggests that it is important for key stakeholders, such as government entities and prominent organizations involved in the development process, to prioritize the promotion of globalized approaches to development over indigenous cultural practices.

The government, along with key stakeholders such as UNESCO, the United Nations, and the Nigeria Ministry of Culture and Tourism, possess the ability to reframe this narrative through their agenda-setting role. By doing so, they can elevate the significance of the abundant cultural heritage of Ile Ife, rather than portraying it as inferior, to contribute to the realization of the sustainable development goals by 2030. The results of the study indicate that, on average, a significant proportion of the 201 cultural sites on Ile Ife, specifically 62%, have not demonstrated effectiveness in advancing the goals of sustainable development. These results align with the research conducted by Nwaolike (2021), which shows that the utilization of mass media may effectively transmit Nigerian culture to its population, resulting in both cultural transformation and preservation. Nevertheless, individuals often find themselves disconnected from their cultural heritage due to a lack of knowledge or emotional connection to their origins. This disconnection can be attributed, in part, to insufficient efforts by the media to foster awareness and appreciation of one's cultural roots, despite their potential to facilitate such awareness.

## **Conclusion**

Based on the findings, it can be deduced that the Ile Ife Cultural Heritage Site and Festival possess the potential to contribute towards the achievement of the agenda 2030 Sustainable Development Goal, provided that the sector is effectively involved in the implementation of SDG policies. The Ile Ife Cultural heritage sector prioritizes the promotion of the Sustainable Development Goals 2030 through a range of activities that take place annually during cultural events in the historic town. The ineffectiveness of the government and other essential stakeholders in the cultural sector in promoting the sustainable development agenda might be attributed to their insufficient commitment.

## **Recommendation.**

1. The Nigerian government, United Nations, and UNESCO should create a conducive atmosphere for the preservation and promotion of the Ile Ife Cultural Heritage sector, as it can serve as a significant platform for the realization of the Sustainable Development Goals (SDGs) agenda.
2. It is imperative for governments and private groups to provide financial support for cultural programming disseminated through the media, given that the media serves as a potent instrument for facilitating societal transformation.
3. Lastly, it is imperative that the cultural heritage sector be recognized as an independent objective within the Sustainable Development Goals (SDGs) to effectively implement the SDG Goals 2030 in Ile Ife, Osun, and Nigeria.

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## 2. Role of Non-State Actors in Security: The Case of The Western Nigeria Security Network.

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### Abstract

Security is a critical issue to sustainable development, good governance, and economic growth. Hence, the UN-SDGs recognise security as a cross-cutting issue around the globe. The research aimed to explore and analyse security fields focusing on Nigeria where crime control and security governance have been highly politicised. It is set within the international literature on nodal security governance to explore the network of security actors to political elites and the role of the political class in shaping the institutions of security to achieve the UN-SDGs. The research was guided by two key organising concepts: the governmentality theory of Foucault (2009) and the field-analytic method of Bourdieu & Wacquant (1992). The emergence, exigence, and prominence of Western Nigeria Security Networks validated the theoretical and empirical framework of the study. The narrative habitus of the nature and position of WNSN reflecting the respondents' views on the quality arrangement and positioning in terms of performance, finance and equipment are still ongoing and cannot be delineated. Finally, some preliminary observations based on the findings are concisely outlined.

**Keywords:** Non-state Security, Nigeria Police Force (NPF), Western Nigeria Security Network (WNSN), Security governance, and Sustainable Development Goals (SDGs).

### Introduction

Today, as a key determinant to sustainable development, good governance, and economic growth, security has become a desired goal for almost all nations around the globe. Hence, security has largely been non-state-centric since the end of the Cold War in the early 1990s. It has since no longer primarily concerned about the state and the protection of its territories against threats or external attacks but advanced to a more comprehensive and inclusive agenda that considers people as a major factor (Harel-Shalev & Wolberg, 2020). In the bargain, another legacy of the Cold War is the reckless flow of arms around the world, which are increasingly and freely available to private terrorist and criminal groups, as well as the easy transfer of technology for arms production and operation. Patently, these weapons were dispensed generously to allies and proxies, and today they proliferate around third-world countries (Magyar, 2003). The ruthless use of these pervasive weapons has escalated the long-lasting wars in Somalia, Ethiopia, Sudan, Democratic Republic of Congo (IRC, 2022), and the endless terrorist attacks (Asadu, 2023) and violence of separatist movements (Nwangwu, 2023) in Nigeria as the weapons are more available than bread and candies on the street of African countries. UN-Security Council (2023) meetings coverage and press? The release revealed that most armed conflicts and crimes in Africa are largely initiated, sustained, and exacerbated by weapons, which also results in the destabilization of communities, states and sometimes regions. In addition, UN-Human Rights (2022) pointed out that armed conflicts are increasingly and severely combatted in highly populated areas, and so many of the casualties killed and injured by the weapons are

civilians, mostly women and children. In consequence, when social, commercial, infrastructural, cultural, educational, religious, and healthcare facilities are mangled, without doubt, there is a long-term impact on a wide range of human rights (Council of Europe, 2023; UN-Security Council, 2021). On the grounds of this, the world has witnessed a much broader range of security threats and risks compared to the past. These security challenges and risks are intimately interconnected and in consequence, the circumstances in a particular region can grievously impact the circumstances in other regions. Simultaneously, nearly all the current challenges and risks in one region of the world are largely common to the adjacent regions, or we could simply assert that also in many outlying regions. This solely highlights the complexity of the contemporary international security domain (Ivancik *et al.*, 2014).

Putting it as it is, security has witnessed several conceptual shifts, but a definite starting point for understanding the term security is to query: “What is security?” (von Boemcken & Schetter, 2016). Rubenstein (2017) posited that security as a term is an ambiguous concept that has no generally adopted definition as there is no specific consensus regarding its meaning to meet every age and phase; and undeniably, security is murkily difficult in 'scope as well as in definition'. There are fundamental assumptions that those who use the term security most are 'state-centric', the realist school of political philosophy; therefore, the nation-state is the primary actor while its citizens and allies are the primary objects of concern. Harel-Shalev & Wolberg (2020) insisted that security is more than the right to live without fear of crime and even beyond the security of tenure or security from disasters and other social, economic, and cultural factors that affect the security of individuals. Nyborg and Nawab (2021) asserted that security is safety from threat and attack, a neologism that is applied differently to the strand of psychology, public safety, defence, and military matters; and can be simply viewed as a state of being secured, a freedom from apprehension, a confidence of safety, and a freedom from danger. In Buzan (1984), Bodunde *et al.*, (2014), Nilsson & González-Marín (2019); Chonka *et al.* (2023)'s view, security is concerned with freedom from risk, fear, tension, maltreatment, or attack on individuals as a people or group and as well as their valuable qualities. In the same view, William (2008) aligned that security is the capacity of a nation-state to provide assurance and protection against any element of insecurity which undermines 'the survival of human beings' and the state. Relating to the needs of African nations, Hirsch Ballin *et al.* (2020) opined that security means resisting all forms of threats that can hinder a nation's survival - including external aggression, challenges of economic, political, social, and cultural deprivations - relating the challenges of political development and good governance facing the countries. Resting on human ideas, culture and perceptions of reality, the term security earns different values. It means different things to different people across states, regions, or continents at different times; and can be used in various ways, including the defence, political, economic, societal, and environmental sectors.

Notwithstanding the views held about the term security, numerous scholars such as Buzan (1984), Harel-Shalev & Wolberg (2020), Hirsch Ballin *et al.* (2020), Nyborg & Nawab (2021) consented that the challenges of security are largely justified by the stability and predictability of the nation-states, and the sustainability of state economic development and peace. Therefore, the fear of insecurity precipitately ignites the pursuit of security by nation-states; and without an iota of doubt, nearly all nations around the globe chunk a colossal proportion of their budgets into security and defence (Ballester, 2013; SIPRI, 2022). The assertions on security and development stability can best be summed up in the collective views of the Council of The European Union (2008) in the Report on the Implementation of the European Security Strategy and Giovannetti's (2023)'s note on Security-

Development Nexus that 'there cannot be sustainable development without peace and security, and without development and poverty eradication there will be no sustainable peace.' Threats to life, health, freedom, wealth, and human rights undermine development. In essence, if security is comprehensively ambiguous, complex, controversial, diverse, and largely related to serious and sensitive political issues and other diverse perspectives, therefore understanding the concept of security is surely an intellectual exercise that searches and generates the necessary conditions of security, as identification of such conditions presupposes a concept of security.

As it is, no place is seemingly secured in Nigeria. The nasty circumstance has grown to a scale that Nigerians, precisely the government and security actors, are bewildered and at the loss of the idea of effective measures to be taken in controlling or averting the menace of insecurity in the country. Overtly, the issue of security threats in Nigeria has persistently become worrisome and pervasive that scholars in the field of security attributed the circumstance to 'the apathy and nonchalance of the government and inefficiency of the security agencies (Wilson, 2018; Wilson, 2020; ONSA, 2020) while others ascribed it to lack of enabling legislations and potent counterstrategy to combat the deteriorating security condition (Robert-Okah, 2014; Akpan, 2018; Onuoha, 2019). On the issue of insecurity, Nigeria is the most severely affected country in Africa. Insecurity has attained a deteriorating scale in nearly all states in Nigeria (Aboderin & Okenyodo, 2017). The country has been combatting unprecedented security problems over the past two decades, ranging from criminalities such as pipeline vandalism, hostage-taking and kidnapping for ransom to ethnoreligious threats in the forms of riots, demonstrations, agitations for resource sharing and control by the Niger Delta militants, herdsmen attacks and violent extremism epitomised in the Boko Haram insurgency that is ongoing in the north-east of the country (Aboderin & Okenyodo, 2017; Akpan, 2018; Amaize *et al.*, 2019). The growing trend of insecurity consequently poses serious challenges to economic development as it significantly affects foreign direct investment (FDI) coupled with poverty and unemployment which result in a cycle of violence. Drawing from the end-of-the-year report of the Institute for Economics and Peace, the country was ranked 143 out of 163 countries worldwide and scored 2.725 in the 2022 Global Peace Index (IEP, 2022), indicating a very low level of peace due to incidents of violence, insecurity, and criminality. With a strength of more than 350,000 men and women, the NPF is expected to cover all 36 Nigerian states and the Federal Capital Territory, Abuja (Interpol, 2021). Tackling Nigeria's security challenges will unequivocally become impossible for this number of police officers. Hence, the need for non-state security providers becomes imperative.

The key gap in this study is the failure of the formal state policing actor (NPF) to provide a formidable security of lives and properties for Nigerians. Empirical evidence has convincingly demonstrated that formal state policing actors have not wolfed down the contributions of non-state security actors to safety provision. Conversely, non-state provision of safety is growingly becoming a prevalent character of contemporary policing. While there is some work on security governance in South Africa (Froestad and Shearing, 2012) and Nigeria (Inyang and Abraham, 2013; Kwaja *et al.*, 2017; Momodu, 2020; Kwaja, 2020; Nwokolo, 2020) little is known about the application of the International Political Sociologist perspective to governance of security (see: Rose *et al.*, 2009; Rose & Miller, 2010; Merlingen, 2011; Froestad and Shearing, 2012; Froestad *et al.*, 2015; Schuilenburg, 2015; Bigo, 2016; Devroe *et al.* 2017; Whelan, 2017; Whelan & Dupont, 2017; Rolfe, 2018; Bowden, 2019; Berg & Shearing, 2020; Busse, 2021) in post-colonial Nigeria. So far, so good, none of the existing works of literature has researched on Nigeria's security challenge or the WNSN using the concept of security governance generated

from the work of Foucault and Bourdieu as largely used and promoted by International Political Sociologists such as Johnston & Shearing (2003), Dupont (2004), Wood and Dupont (2006), Wood & Shearing (2007), Rose *et al.* (2009), Rose & Miller (2010), Merlingen (2011), Froestad & Shearing (2012), Froestad *et al.* (2015), Schuilenburg (2015), Bigo (2016), Devroe *et al.* (2017), Whelan (2017), Whelan and Dupont (2017), Rolfe (2018), Bowden (2019), Berg & Shearing (2020) and Busse (2021). Security governance is a newly emerged theoretical and analytical technique applied to explain the paradigm shift in transatlantic security policy from a state-centred approach to one that examines the sophisticated networks of state and non-state actors to solve security challenges from global to regional and individual levels, and from traditional military security to the newly rising non-military security production and provision (Krahmann, 2003; Krahmann, 2005; Liao, 2013).

## **Research Design and Methodology**

The study applied a mixed-method research strategy to generate both quantitative and qualitative data. The field analytic method (Bourdieu and Wacquant, 1992) was used to identify the distribution of economic and symbolic capital (Bourdieu, 1993) combined with SPSS (Statistical Package for the Social Sciences) (Rahman and Muktadir, 2021, Pandian *et al.*, 2022; Karamurugan and Govindarajan, 2023). Hence, this study determined the security field positions and the strategies and dynamics of position-taking. It utilised in-depth interviews with the key security actors (formal state and non-state security actors) to identify the role of political intervention in shaping the field.

1. Analysis of Secondary Data Sources. This study employed the process of secondary analysis that will (a) develop the research questions, (b) identify the dataset and (c) evaluate the dataset to provide answers to the following questions: How do security fields form in the post-colonial context on the continent of Africa? What is the form of networked security governance in these contexts? What role does the politicisation of security fields play in the distribution of symbolic capital? How does this complicate the model of security governance developed by Whelan and Dupont (2017), and Bowden (2019)? The practice of using secondary data in research to save both time and money (Crossman, 2020), and as well avoid unnecessary duplication of research effort (Johnston, 2014).

2. The Online Survey of Security Actors was designed and analysed to provide insights into security producers and providers including state and non-state security actors e.g., the political actors (executive and legislators), security experts (police commissioners and WNSN commandants), security scholars (students, researchers, and lecturer in security field) and traditional rulers. Respondents were asked what security actors they had engaged with; why they engaged them; and asked about the quality arrangement of the non-state security network. The data enabled the classification of respondents into distinct security positions using SPSS (Statistical Package for the Social Sciences) (Rahman and Muktadir, 2021; Pandian *et al.*, 2022; Karamurugan and Govindarajan, 2023) to model field relations (Bourdieu, 1984). The survey allowed the categorization of distinct security habitus that will be then explored qualitatively. The categories also assisted in shaping the sampling strategy for the qualitative inquiry.

3. In-depth interviews with a sample of 20 key actors in the security field in Nigeria were conducted, in which a sample of participants reflected the main categories of respondents in the survey. The interviews are used to access narrative habitus (Sandberg and Fleetwood, 2017) and will be designed and analysed to explore security as a field understanding together with the deeper level dispositions within the habitus. The qualitative analysis of

this data is currently ongoing at the time of presenting the study for conferencing.

### **Conceptual and Theoretical Framework**

Here is the theoretical background of the study that illustrates the logic behind the transformation of the political field of security from state-centric to non-state-centric. I approach this study from the development of two opposite trends. The first approach concerns the growing involvement of non-state actors in the governance of security in both internal and national security. The second approach concerns the position occupied and the role played by state security actors in the governance of security both internal and national security. The expansion of the security field can be understood by using a broad, eclectic conceptual palette. This includes the theory of securitization, the concept of security governance through Foucault's theory of governmentality, Bourdieu's theory of field, habitus and capital, and the concept of security networks. Securitization is a process in which objects and values become framed as security issues by some actors and thereby get an elevated status as both important and urgent to manage (Buzan *et al.*, 1998). Security governance means that the complexity of the new threats, the weakening of the state monopoly on the provision of security and the rise of cost-efficiency as a legitimising mechanism advance geographical and functional specialisation among state and non-state actors to minimise the cost of providing national and international security (Krahmann, 2005; Liao, 2013; Schuilenburg, 2015). Criminologists are employing Bourdieu's theory to work by mobilizing and deploying the concepts of the field (Shammas and Sandberg 2016), social capital (Ilan 2013), cultural capital (Sandberg 2008), and habitus (Fleetwood 2016; Sandberg and Fleetwood 2017) to solve real research problems. Network theories, concepts, and approaches have been applied to a broad array of crime and security challenges as well as governmental responses to these issues. However, this rapid growth of network research has been accompanied by differing conceptions about what a network is and what network perspectives are (Bright and Whelan, 2022). The police are a body of officers representing the civil authority of the government. Police are typically responsible for maintaining public order and safety, enforcing the law, and preventing, detecting, and investigating criminal activities (Kelling *et al.*, 2021). Therefore “policing” is the government competency that is used to improve the living conditions of the people. Nearly everything falls within the realm of the police. Police position and role cannot be neglected in the governance of national security networks. Unequivocally, it appears neither possible nor desirable to govern many of the new security challenges tormenting the globe by controlling the national border or the use of force (Amicelle *et al.*, 2017; Nøkleberg, 2023), hence the need to consider the non-state security actor.

In today's world of security, non-state actors play a crucial role in national and international security programmes. Largely, they contribute positively to the security and stability of countries that adopt non-state security provisions as a component in their strategic policy approach to security. No gainsaying, non-state security actors have gained prominence in the security policy areas in significant ways. Hence, this study aims to develop a clearer view of the roles and influence of non-state actors. In particular, the researcher will elaborate on the interactions between state and non-state actors, whilst acknowledging that the relative power and influence of State and non-state actors cannot always be easily estimated. Not until the 21st century the security world was solely dominated by states. Notwithstanding its years of existence, no doubt, anywhere in the world, non-state security actors are performing exceedingly well.

## Literature Review

Here, the study discussed relevant works of literature on this topic in context. It critically analysed, evaluated, and synthesised literature on the subject to give a clear picture of the current knowledge base of this study.

### Security and Sustainable Development.

Security and sustainable development are two crucial concepts that are intimately intertwined and interdependent. They play significant roles in fashioning the well-being of states' economies and governance. Security and sustainable development give prominence to new challenges for research and policy (Granit *et al.*, 2015). Security deals with the protection of individuals, communities, and nations from threats, risks, and harm (Hirsch Ballin *et al.*, 2020). Traditionally, security has been associated with military and defence measures to safeguard against external threats such as armed conflicts, terrorism, and aggression (Newman, 2010). However, the concept of security has evolved to encompass a broader range of areas, which include human security, environmental security, economic security, cybersecurity, and food security (Newman, 2010; Babu, 2016; Hirsch Ballin *et al.*, 2020). Sustainable development is concerned with the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (IISD, 2023 and Imperatives, 1987, page: 16). Sustainable development is mainly guided by three crucial pillars, including economic sustainability, social sustainability, and environmental sustainability (Purvis *et al.*, 2018; Berrone *et al.*, 2023). Gaines (2006) illuminated that sustainable development reconstitutes diverse social, economic, and political factors fashioning environmental conditions and environmental governance, which were conspicuously absent from the conventional analysis of environmental scarcity and violent conflict. For good measure, the social and economic dimensions of sustainable development also explicitly initiate a broader conception of security (Mensah and Casadevall, 2019). Coming into this view, Berrone *et al.* (2023) noted that researching the nexus between security and sustainable development, without doubt, illuminates learning to broader, more complex, and ultimately more meaningful ties between personal security and development. This brings to the mastery of the conceptually powerful notions of human security concerning states and peoples.

Hence, security and sustainable development are intimately related and mutually strengthening. A secure state, both in terms of traditional security and other dimensions such as health, education, and economic stability, is crucial for attaining sustainable development goals (Mensah and Casadevall, 2019). Conversely, sustainable development contributes to building a more secure world by addressing the root causes of conflicts and instability (Peters and Peters, 2021). Some key points to consider in their relationship are conflict prevention, societal resilience, inclusive participation and growth, environmental protection, and global cooperation. Seemingly, sustainable development initiatives framed with security can help address the underlying causes of conflict, such as poverty, inequality, and resource scarcity, reducing the likelihood of violence and instability (Mensah and Casadevall, 2019; Peters and Peters, 2021). In short, security and sustainable development are intently intertwined concepts that require a holistic and integrated approach to address complex challenges facing the world today. By prioritizing both security and sustainability, the state can work towards a safer, more prosperous, and resilient future for all humanity.

### Security and Good Governance

Security and good governance are intensely interconnected and mutually reinforcing concepts that play a pivotal role in ensuring stability, prosperity, and the welfare of states (Fjäder, 2014). Security, in this context, means the

protection of individuals, communities, and nations from various threats and risks, both internal and external. These threats can include armed conflict, terrorism, crime, economic instability, environmental degradation, and public health emergencies. Consequently, security measures will aim to prevent, manage, and respond to the challenges to maintain peace, stability, and the rule of law (Alam *et al.*, 2022). Good governance indicates a set of principles and practices that advance effective, accountable, transparent, and inclusive decision-making processes within governments and institutions (Bundschuh-Riesender, 2008). It involves fostering an environment where public resources are managed efficiently, the rule of law is upheld, human rights are respected, and the interests of all citizens are taken into consideration (Carothers and Brechenmacher, 2014). It is keenly essential to ensure that governments are responsive to the needs of their citizens and that they can effectively address challenges and provide public services (Meetika, 2009). Relating briefly to the two concepts, good governance establishes the rule of law, ensuring that laws are applied fairly and consistently. This creates a stable and predictable environment that enhances security by deterring criminal activities and preventing abuse of power (Seifi *et al.*, 2021). The Human Rights Council has identified the following as the key attributes of good governance: transparency, responsibility, accountability, participation, and responsiveness (UN-OHCHR, 2023). Inclusive governance mostly encourages citizen participation in decision-making processes; and when people have a voice in their government and can influence policies, they are more likely to support and cooperate with security measures (Bundschuh-Riesender, 2008; Carothers and Brechenmacher, 2014). In addition, good governance guarantees respect for human rights, which is not only ethically important but also largely contributes to social cohesion and security (Bundschuh-Riesender, 2008; Seifi *et al.*, 2021; UN-OHCHR, 2023). Succinctly, the connection between security and good governance is equally intertwined with the connection between security and sustainable development. Good governance offers the framework and practices that enable governments to effectively address security challenges, while security measures also contribute to creating an environment conducive to good governance by ensuring stability and protection of citizens' rights.

### **Security and Economic Growth.**

Security and economic growth are firmly interconnected, and their connection is requisite for the overall welfare and development of the states (Retter *et al.*, 2020). A secure nation fosters conditions that are conducive to economic growth, while economic growth, in turn, contributes to improved security (Asghari, 2017; Denoon, 2001). Security as a prerequisite for economic growth, a secure state with low levels of crime, political stability, and absence of conflict is a key condition for businesses to operate and for investments to take place. Certainly, investors are more likely to commit resources in stable states (Rebić and Antić, 2021). Considering investments and investors, a secure state attracts both domestic and foreign investments. Investors are more willing to invest when they believe their investments are protected and will yield returns without significant risks (Du *et al.*, 2022; Rebić and Antić, 2021). Secure and stable international relations and trade promote the movement of goods and services, fostering trade relationships and economic cooperation between a nation and the outside world (Denoon, 2001). Regarding infrastructure development, security is necessary for the construction and maintenance of critical infrastructure such as transportation networks, energy facilities, and communication systems (Du *et al.*, 2022; Rebić & Antić, 2021). Seemingly, economic growth leads to increased employment opportunities, poverty reduction, a rise in government revenue, and improvements in social services. Some scholars (Denoon, 2001; Ajibola, 2016; Asghari, 2017; Retter *et al.*, 2020; Rebić and Antić, 2021; Du *et al.*,

2022) shared a common view that security and economic growth create a positive feedback loop. Retter *et al.* (2020) pointed out that a growing economy provides governments with resources to invest in security measures, which in turn, enhances stability and creates a favourable environment for further economic growth. Economic growth leads to improved living standards, which reduces the motivation and motive for criminal activities and social unrest. As a matter of challenges and trade-offs, however, Yusuf and Mohd (2022); Rebić and Antić (2021); and Ajibola (2016) indicated that it is crucial to note that while security and economic growth are mostly positively correlated, there can be instances where conflicts, insecurity, or imbalances in economic development may adversely affect this relationship. In some situations, rapid economic growth without proper distribution of benefits can lead to inequalities, social tensions, and potential security risks. Economic growth, if not well-managed, can cause negative effect on nations security. For instance, the OECD (2004) pointed out that “growth in air, rail, road, and marine transport can increase the risk of security breaches that facilitate robbery, organised smuggling,” and many other noxious crimes in some countries around the world such as Nigeria (Yusuf and Mohd, 2022; Ajibola, 2016; Rebić and Antić, 2021).

In a nutshell, security and economic growth are mutually enabling factors. Manifestly, a secure state is a prerequisite for sustainable economic growth, as it stimulates investment, trade, and development. Simultaneously, economic growth can contribute to improved security by providing jobs, reducing poverty, and enabling governments to invest in security-related infrastructure and services. Mostly, reaching a balance between security and economic growth is essential for building stable and prosperous nations.

### **Current State of the SDGs 2030: the Security in Sustainable Development Goal 16.**

Imperatively, sustainable development cannot be without peace and security; and peace and security will assuredly be at risk without sustainable development (UNDESA and IDLO 2019). Sustainable Development Goal 16 is mostly about promoting peaceful and inclusive societies, providing access to justice for all and building effective, accountable, and inclusive institutions at all levels of the societies. People everywhere should be free of fear from all forms of violence and feel safe as they go about their lives regardless of their ethnicity, faith, or sexual orientation (UN-SDG, 2023). Among the 10 policy targets of SDG 16, 'Peaceful societies' through security and safety largely remains the most prominent key term, the utmost talk-about in the fora of researchers and policymakers, since peaceful societies are the foundation of sustainable development, good governance, and economic growth (ECA, 2021). Understanding the situational status of SDG 16 concerning each of its targets, a swift grasp of 'Sustainable Development Goals Report 2021: Extended Report – Goal 16' revealed that there was a 5.7% fall in the global homicide rate, a 61% drop over five years in armed conflict, and inclusive institutions at all levels, which meant a significant shift from micro-to macro-organizational focus. Evidently, the general goals of SDG 16 are reinforced by several specific targets, especially “Target 16.a”, which seeks to “Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime.” Africa, especially Sub-Saharan Africa, remains the third most violent region in the world and is showing a slightly significant fall in peacefulness in the last years, with a full 40% of people in the region feeling less safe today compared to five years ago. Regarding justice and democracy, Africa has significantly gained some democratic states, including Benin, Gambia, and Nigeria, with hybrid and authoritarian regimes in Ethiopia and



Sudan. However, these African countries are battling diverse threats and risks to date. Talking about striving towards achieving the objectives of SDGs, African countries have actively adopted SDGs 2030 as their essential pursuit, which has earned them relative clout in an international forum. This adoption was proportional to the interest in governance as reflected across the continent, such as the 2007 adoption of the African Charter on Democracy, Elections and Governance, and the inclusion of governance in the foremost objectives of Agenda 2063 of the African Union (African Union, 2014; Cling *et al.*, 2018). Reflecting on this, Cling *et al.* (2018) contended that the interest demonstrated by few African leaders in the topic of governance as documented in many global reports and journals is nothing but a smokescreen to divert attention from the weak institutions in the African countries. On the other hand, China, India, and Russia were the most reticent countries to SDGs 2030; and they found themselves increasingly isolated, to the extent that they grumpily complied with the majority, especially by the change in position of African countries. The continent of Africa actively supported SDG 2030 and was therefore able to tip the scale in its favour like Brazil.

On a wider scale, the SDGs Report for the year 2023 revealed that the impacts of the climate crisis, the war in Ukraine, a weak global economy, and the lingering effects of the COVID-19 pandemic have expressly demonstrated weaknesses and hindrances towards the progress of SDG 2030. In essence, the report sternly warned that while lack of progress is universal, it is the world's poorest and most vulnerable people and states that are facing the worst effects of these unpleasant global challenges. It also revealed areas that need urgent and rapid action to rescue the SDGs to deliver significant headway for people and the planet by the year 2030 (UN-SDG, 2023). Consequently, the most disturbing question is: how realistic is the SDGs 2030 in less than 7 years to the deadline? The comment of António Guterres, Secretary-General of the United Nations, on the realisation and attainment of Sustainable Development Goals Objectives intimately replied to the one-million-dollar question when, on 25 April 2023 in New York, remarked to launch the Special Edition of the Sustainable Development Goal (SDGs) Progress Report that “Unless we act now, the 2030 Agenda will become an epitaph for a world that might have been” (Guterres, 2023). The report revealed that more than half the world would be left behind; only 12% of the SDG targets are on track. Progress on 50% is weak and insufficient. Worst of all, we have stalled or gone into reverse on more than 30 per cent of the SDGs. The COVID-19 pandemic and the triple crisis of climate, biodiversity and pollution are deepening a devastating impact, escalated by the Russian Federation's invasion of Ukraine; the population of people living in abject poverty today is higher than it was 4 years ago. In short, only 30% of all countries will attain SDG 1 on poverty by 2030. The report specifically mentioned neither peaceful and inclusive societies nor security (UN-DESA, 2023).

### **Overview of the WNSN (Amotekun)**

The prevalent kidnapping on the highways, farmland invasion of herdsmen, bank robbery and other menaces involving criminals from the Northwest in the Southwest geopolitical region of Nigeria (Aboderin & Okenyodo, 2017) and the failure of the NPF (the state-owned security actor) to secure lives and properties specifically in the region and the nation in general impetrated the urgent need and establishment of the Western Nigeria Security Network (WNSN) code-named as “Amotekun.” The widespread protests over deadly conflicts between Fulani herders and local farmers and kidnappings growingly involving criminals from the Northwest triggered the action of governors of the six states (Ekiti, Lagos, Ondo, Oyo, Ogun, and Osun) in the region to marshal the

security network on 9 January 2020, to protect their states (Feyisipo, 2020; David and Oyedele, 2020; Olubade and Ogunnoiki, 2020; EASO, 2021). Amotekun was coined as a Yoruba word and the name of a gallant wide cat called a leopard. The Yoruba well-liked myth has it that Amotekun (the leopard) symbolically denotes strength, perseverance, ambition, independence, toughness, patience, wisdom, and fearlessness. As a fearless creature, Amotekun is famously known for its unique hunting tactics as well as its capacity and capability to defend its territories from intruders in the jungle. Hence, the Southwest formed WNSN as a regional security outfit to consist of the vigilante group, security experts and other Yoruba socio-cultural groups participating in local security (e.g., local hunters, Oodua People's Congress (OPC) and "Agbekoya"), from each state of the zone (David and Oyedele, 2020; Obado-Joel, 2020), to complement the efforts of formal security agencies, which include Nigeria Police Force (NPF), NSCDC, and other state security institutions in tackling security threats in the region (Obado-Joel, 2020).

The security outfit was formed after a series of meetings by all the six state governors at the regional security summit held in Ibadan, Oyo State, Nigeria in June 2019 through the Development Agenda for Western Nigeria Commission (DAWN) (Feyisipo, 2020; David and Oyedele, 2020). Many works of literature such as Obado-Joel (2020); Olayiwola (2020); Feyisipo (2020); EASO (2021) submitted to the view that this development is the key strength of WNSN. At the same time, Obado-Joel (2020) pointed out that the strength of Amotekun is conceivably its primary weakness because it derives its power from the collective cultural identity among the six states and their shared grievance against incessant attacks and killings perpetrated by the nomadic herdsmen from Northwest. Nevertheless, as a strength, the collective identity reinforcing WNSN may be a force for advantage or disadvantage. Western Nigeria Security Network aims to complement the efforts of the NPF and NSCDC as a regional security network with units in each state (EASO, 2021). The local government organ coordinates the activities in its specific jurisdiction and as well relates to the state commands while each state command relates to the regional command in the same order. The control centre in Ibadan, Oyo state is the regional command headquarters while the operational base is in Gbogun, Osun state, and they both function closely with the Developmental Agenda for Western Nigeria (DAWN) Commission, which gives administrative supervision for the security network. In each state of the region, the Commissioner of Police supervises the pursuit of security by each state's command. Security Trust Fund is readily provided by the six states to foot the bill of the regional security agency, which the Commissioner of Police supervises. According to WNSN's formational framework, each state is expected to recruit the number of officials they can maintain (David and Oyedele, 2020). Certain features of Amotekun, however, have distinguished the security network from other non-state security providers in Nigeria, such as the CJTF, the Kano State Hisbah Corps (KSHC), the Ebonyi State "Neighborhood Watch Group" (ESNWG) and many more. To this day, the WNSN remains the first and best of its kind (Obado-Joel, 2020).

### **Role of WNSN in security provision in the Southwest region of Nigeria**

The Western Nigerian Security Network, commonly known as "Amotekun," is a regional security outfit established by the Southwest Governors of Nigeria to combat security challenges in the region (Odewale and Lamidi, 2020). WNSN was officially launched in January 2020 and established to complement the efforts of existing state-owned security agencies in the region (Olushola and Adeleke, 2020). Its formation came in response to increasing security risks and threats, such as kidnapping, armed robbery, and farmer-herder

conflicts, affecting the safety and well-being of residents in the Southwest region (Out and Apeh, 2022), which consists of Lagos, Ogun, Oyo, Osun, Ekiti, and Ondo. From its inception till date, WNSN as a non-state security actor, has been ably performing the following key roles and functions in providing security to reduce the risks and threats in the region, by extension in Nigeria:

**(a). Community Policing and Intelligence Gathering:** WNSN engages in community policing by collaborating closely with local communities to gather intelligence about criminal activities and threats (Osoteku, 2023). Their presence in communities enhances trust and communication, making it easier to identify potential security risks (Awojobi, 2022). Its operatives are often drawn from local communities and have a better understanding of the social dynamics and security challenges in their respective areas. This enables them to establish trust and work closely with residents to identify and address security concerns (Osoteku, 2023).

**(b). Vigilance, Surveillance, and Rapid Response to Emergencies:** Amotekun provides a rapid response to emergencies, such as kidnappings and robberies (Awojobi, 2022). Their agility and local knowledge allow them to respond quickly and effectively to incidents, potentially preventing escalation (Odeyinka, 2021). Amotekun's vigilance and surveillance activities, which include patrols and intelligence gathering have helped in the early detection of security threats and criminal activities (Awojobi, 2022; Ezinwa and Dayil, 2020).

**(c). Counter-Kidnapping, Anti-Cattle Rustling, and Protection of Rural Areas and Farmlands:** WNSN addresses the challenges of farmer-herder conflicts by patrolling rural areas and farmlands to prevent clashes between farmers and herders (Aderayo and Olusola, 2022). This contributes to agricultural productivity and reduces tensions. The security outfit largely focuses on providing security in rural and remote areas where criminal activities like kidnapping, armed robbery, and cattle rustling are prevalent (Otu and Apeh, 2022). Hence, its presence helps in deterring criminal elements and responding quickly to incidents. Given the prevalence of kidnapping and cattle rustling in the region, Amotekun focuses on countering these specific crimes. They work to rescue kidnapped victims and recover stolen livestock (Aderayo and Olusola, 2022; Oluro and Oluwasuji, 2021).

**(d). Complementing Law Enforcement:** WNSN (Amotekun) serves as a complementary security structure to existing law enforcement agencies, such as the police (Ajiboye, 2023; Oikhala, 2022). While it does not have the same level of authority or power as the police, it assists in maintaining law and order, especially in rural and underserved areas where police presence is mostly limited (Oikhala, 2022). WNSN collaborates with existing formal security agencies like the police, military, and Department of State Services (DSS) to conduct joint operations. These partnerships enhance the overall security architecture of the region (Ajiboye, 2023; Awojobi, 2022). Joint operations with formal security agencies turn out to be hugely an essential function of WNSN.

**(e). Protection of Economic Activities, Border Patrol, and Inter-State Security:** By ensuring the safety of businesses and economic activities, WNSN (Amotekun) contributes to the overall economic growth and development of the region (Nnabuihe *et al.*, 2023; Walker & Igwe, 2023). The security outfit contributes to border security and addresses criminal activities that might cross state boundaries (Walker and Igwe, 2023; Odewale & Lamidi, 2020). Southwest region shares borders with other states and geopolitical zones.

**(f). Youth Empowerment:** Western Nigeria Security Network has provided employment opportunities for many youths in the region, reducing youth unemployment and engaging young people in constructive activities (Mou, 2023; David and Oyedele, 2020). WNSN provides training to its personnel and equips them with the

necessary skills to handle various security challenges professionally and efficiently (Osoteku, 2023). The security network not only provides training and skill development but also provides rare employment opportunities.

**(g). Conflict Resolution and Mediation:** In addition to law enforcement functions, WNSN also engages in conflict resolution and mediation efforts to address community disputes and tensions (Akinselure, 2023; Obado-Joel, 2020). WNSN officials mediate disputes and conflicts at the community level, which results in reducing tensions and preventing conflicts from escalating into violence (Akinselure, 2023).

**(g). Other Sundry functions:** During emergencies, Amotekun is often called upon to provide support, such as during natural disasters or communal crises. Their rapid response saves lives and property all the time (Agbaje *et al.*, 2022). In urban areas, WNSN personnel sometimes assist with traffic control and road safety measures, helping to reduce congestion and improve road safety (Adepegba *et al.*, 2021). In terms of public awareness and education, WNSN also engages in campaigning and helping communities become more aware of security risks and how to protect themselves (Nnabuihe *et al.*, 2023). While the security outfit engages in public awareness campaigns to educate residents about security measures and the importance of vigilance, in consequence, this empowers individuals and communities to take ownership of their safety. The presence of Amotekun fosters public confidence in the ability of local authorities to address security concerns (Osoteku, 2023; Mou, 2023). This can improve citizens' sense of safety and well-being.

In essence, the WNSN plays a crucial role in combatting security challenges in the southwest. Its community-oriented approach, knowledge of local dynamics, and collaboration with formal security agencies contributed to the overall safety and stability of the region.

## Data Presentation and Analysis

The data presented for analysis are sourced from the online survey conducted by the researcher with 515 participants within one month in August 2022. The following variables are analysed: complementing state-owned security apparatus; weakening state-owned security actors; and supporting the objectives of SDG 16 through security provision and inclusion. The statistical software package of SPSS was employed to perform data analysis and processing. A descriptive statistical approach was adopted for processing and analysing the data. The research adopted univariate analysis to explore each variable in a data set, separately. It practically and solely employed measures of frequency distribution for the quantitative data gathered by intensely applying (a) Nominal scale (b) Ordinal scale and (c) Interval scale in the process and analysis.

Considering the demography of the Online Survey, 515 respondents were recorded within a month, before the deadline. After data cleaning, 434 respondents were certified valid for analysis. Data revealed that the participants were key stakeholders with in-depth knowledge of security provision, precisely in Nigeria; 78.1% of respondents had a very high level of security knowledge. Relating to education qualification, 88.3% of respondents had high qualifications (ranging from bachelor's degree, and master's degree to PhD). Respondents' gender revealed: male 68.7%, Female 28.8%, and prefer-not-to-say 2.5%. On active age of the respondents, 89.5% of the respondents fell into the category of active age of 25 to 64 years; and ages 25-34 produced the highest of respondents of 29.5%. Employment status data show that 78.1% of respondents are actively engaged, 63.8% are in full-time employment and 14.3% are students. Here, descriptive statistics for the analysed variables are shown in Tables 1 and 2; Frequency in Table 3.

## QUANTITATIVE ANALYSIS OF ONLINE SURVEY DATA

### Table 1: Response Rate - TOTAL DATA

	Questionnaires Administered	Questionnaires Returned & Valid	Filled Percentage (%)
Respondents	515	434	84.27

Note: After Data cleaning, the Total Data considered is 434.

### Table 2: Descriptive Statistics - DESCRIPTIVE ANALYSIS

	N	Minimum	Maximum	Mean	Std. D
A Nigerian living in Nigeria	434	1	1	1.00	.000
Gender	434	1	3	1.34	.525
Age Group	434	1	6	3.28	1.303
Age (Above 18 years)	434	1	1	1.00	.000
Highest Educational Qualification?	434	1	7	4.53	1.098
Employment Status	434	1	5	1.96	1.492
Occupational Role	434	1	4	2.77	1.036
Consent Box	434	1	1	1.00	.000
Level of knowledge of the range of security providers in the region.	434	1	5	1.80	.871
Frequency of engagement with the security actors?	434	1	5	1.90	.922
Between state and non-state security, which security actor do you engage more with?	434	1	2	1.40	.491
Volunteer to participate in Neighborhood Watch and attending community meetings	434	1	3	1.95	.727
Serve on a Citizen Advisory Board	434	1	3	2.47	.778
Compliment	434	1	3	2.12	.743
Complain	434	1	3	2.38	.592
Participate in Security Initiatives, Projects, and Programs	434	1	3	1.65	.638
Participating in law enforcement surveys	434	1	3	1.64	.634
Volunteer to participate in Neighborhood Watch and attending community meetings	434	1	3	1.58	.722
Serve on a Citizen Advisory Board	434	1	3	2.23	.874
Compliment	434	1	3	1.76	.674
Complain	434	1	3	2.76	.518
Participate in Security Initiatives, Projects, and Programs	434	1	3	1.46	.641
Participating in law enforcement surveys	434	1	3	1.47	.656
Among Non-State Security actors, which do you engage more with?	434	1	3	1.17	.453
Ekiti State Command	434	0	5	1.26	.864
Ogun State Command	434	0	5	1.95	.982
Ondo State Command	434	0	5	4.37	1.512
Osun State Command	434	0	5	2.55	1.010
Oyo State Command	434	0	5	3.65	1.025
Ekiti State Command	434	0	5	1.32	.876
Ogun State Command	434	0	5	1.94	1.014
Ondo State Command	434	0	5	4.34	1.548
Osun State Command	434	0	5	2.52	.992
Oyo State Command	434	0	5	3.56	1.188
Ekiti State Command	434	0	5	1.27	.841
Ogun State Command	434	0	5	1.94	1.007
Ondo State Command	434	0	5	4.36	1.515

Osun State Command	434	0	5	2.54	.985
Oyo State Command	434	0	5	3.59	1.166
In terms of INFORMATION SHARING within the security networks, the WNSN is ranked?	434	1	5	1.61	.862
In your view, how has the State Executives MANAGED the WNSN?	434	1	5	1.65	.825
How will you rate the role of State Legislators in the FORMATION and REGULATION/GOVERNANCE of WNSN?	434	1	5	1.64	.846
In your experience, how do you rate the role of State Police Commissioners in the Operational Supervision of WNSN in the region?	434	1	5	1.66	.854
In your experience, do you regard the networking between The Police and WNSN officials as mutually beneficial?	434	1	4	1.35	.613
In your experience, do you regard the networking among the commands in WNSN as mutually beneficial?	434	1	4	1.31	.586
I regard WNSN officers' response to crime incident as?	434	1	5	1.55	.777
Do you think that WNSN as Security Networks in the Region	434	1	5	1.45	.676
In terms of crime controlling in the region, do you agree or disagree that WNSN is inevitable?	434	1	5	1.41	.695
The quality arrangement of WNSN is?	434	1	5	1.43	.757
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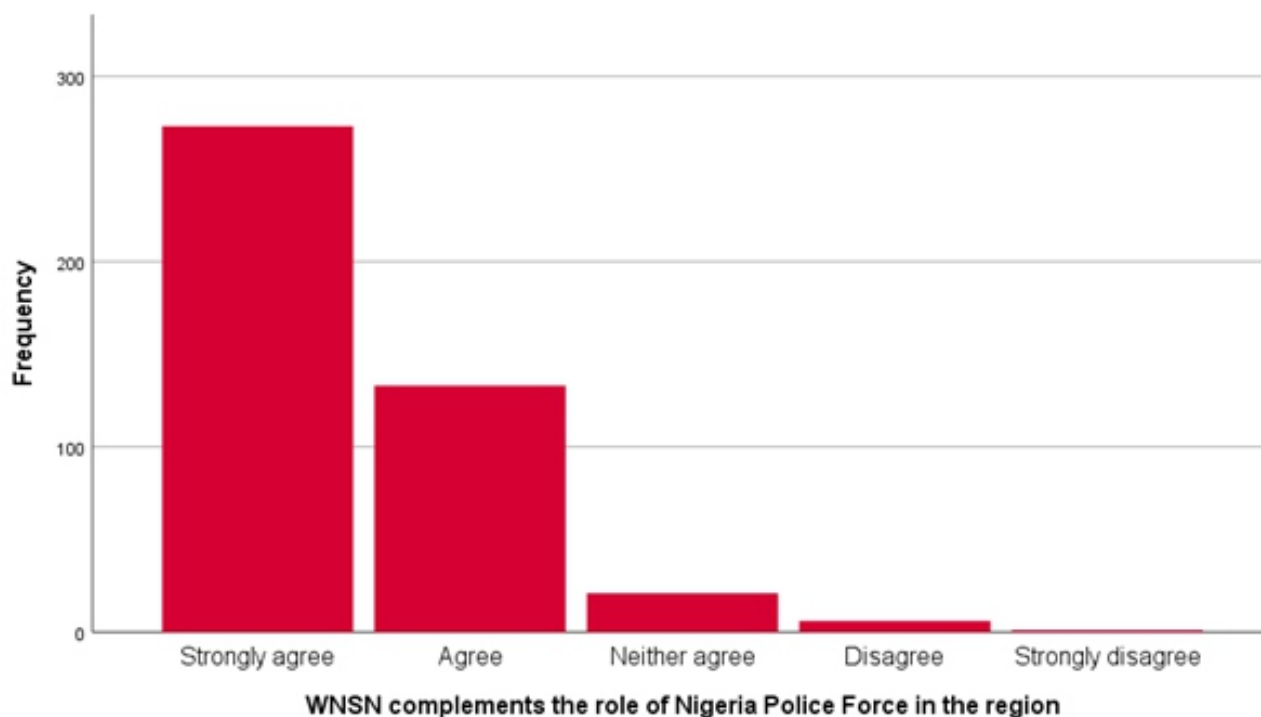
Employment Status				
Employed full-time	277	63.8	63.8	63.8
Employed Part-time	47	10.8	10.8	74.7
Unemployed	21	4.8	4.8	79.5
Retired	27	6.2	6.2	85.7
Student	62	14.3	14.3	100.0
Total	434	100.0	100.0	
Occupational Role				
Political Actor	91	21.0	21.0	21.0
Traditional Ruler	21	4.8	4.8	25.8
Security Scholar	219	50.5	50.5	76.3
Security Expert	103	23.7	23.7	100.0
Total	434	100.0	100.0	

(a). Complementing state-owned security apparatus

**Table 4: WNSN as a Security Network in the region complements the role of the Nigeria Police Force.**

Variable	Frequency	Per cent	Cumulative Percent
Strongly agree	273	62.9	62.9
Agree	133	30.6	93.5
Neither agree	21	4.8	98.4
Disagree	6	1.4	99.8
Strongly disagree	1	.2	100
Total	434	100.0	

From Table 4 and Figure 1, 62.9% of respondents strongly agree that WNSN (Amotekun) is effectively and efficiently complementing the role of the Nigerian police force and other federal security apparatus in providing security in the Southwest region. Less than 2% of respondents disagree while less than 5% neither agree/nor disagree (neutral). The survey reveals that WNSN complements formal state-owned security actors, such as the Nigeria Police Force and other law enforcement agencies, especially in the areas of community-Based approach, and local intelligence and information sharing.



**Figure 1: WNSN Complementing the Role of Nigeria Police Force in the Region**

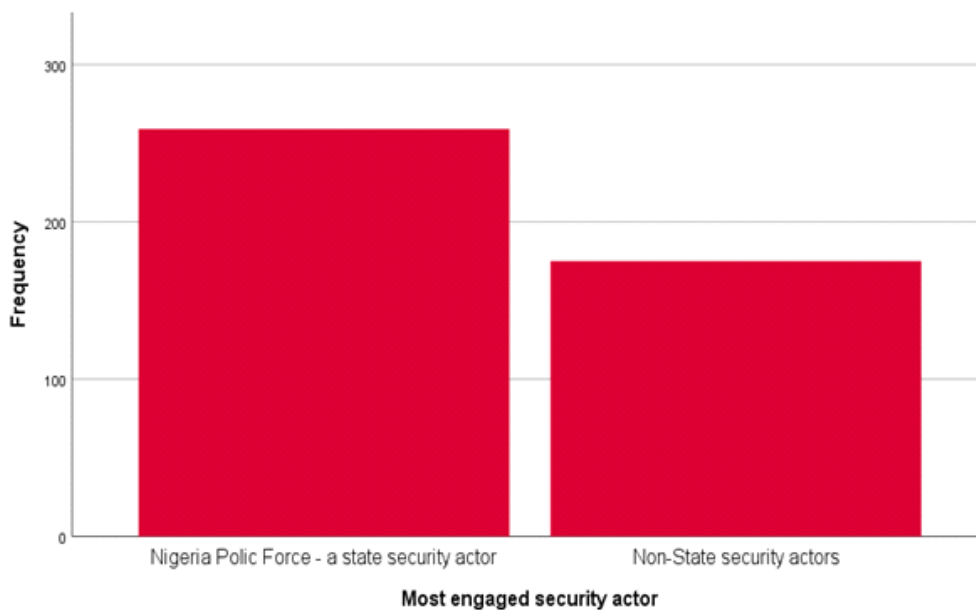
**(b). Weakening the state monopoly of security provision.**

**Table 5: Most engaged security actor (either State or non-state security)**

Variable	Frequency	Per cent	Cumulative Percent
Nigeria Police Force- a state security actor	259	59.7	59.7
Non-State security actors	175	40.3	100.0
Total	434	100.0	



The security network, WNSN as a non-state security actor in the Southwest region of Nigeria has shown the weakness of the formal security agencies of Nigeria. It has dampened the institutional capacity of the Nigeria security apparatus, calling into question the role and ability of the Nigeria Police to protect citizens' lives and property. From Table 5 and Figure 2, congruently, 40.3% of respondents from the survey claimed to engage more with non-state actors when asked the question: “Between state and non-state security, which security actor do you engage more with? Further down, the researcher asked another question: “among Non-State Security actors, which do you engage more with.” In response to this question, 86.4% engage more with WNSN (Amotekun) while 10.4% and 3.2% engage with vigilantes and others respectively, illustrated in the table and figure. This suggests that the police alone can no longer exterminate the numerous security threats and risks challenging the peace of the nation.



**Figure 2: Most Engaged Security Actor.**

- (c). Supporting the objectives of SDG 16 by contributing to security provision and inclusion.

**Table 6: Perspective response to the level of mutual benefit of the network between the Police and WNSN officials.**

Variable	Frequency	Percent	Cumulative Percent
Yes, very beneficial	312	71.9	71.9
Somewhat beneficial	94	21.7	93.5
Neutral	26	6.0	99.5
Not of any benefit	2	.5	100.0
Total	434	100.0	

As shown in Table 6 and Figure 3, 71.9% of the respondents indicate that, based on their experience, the networking between the Police and WNSN officials is mutually beneficial. 6% and less than 1% of the total respondents responded neutral and not of any benefit respectively. This suggests that the mutually beneficial relationship between the police and WNSN is a feature of 'inclusion' as clearly stated in the UN-SDG 16 to achieve peace and safety for the people of the Southwest region.

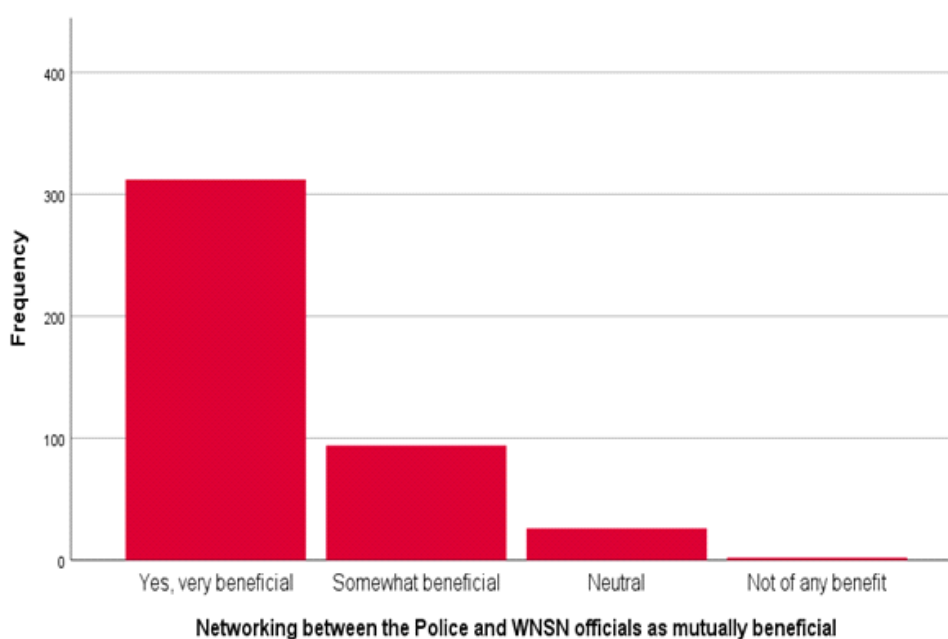


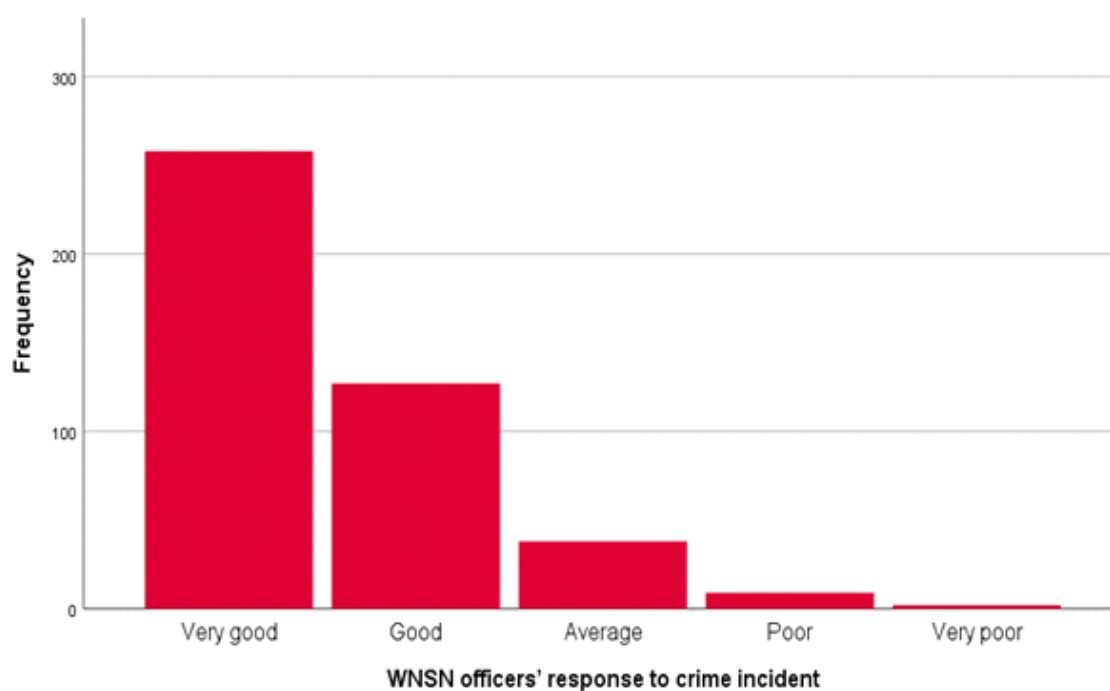
Figure 3: Chart showing the level of mutual benefit of the network between the Police and WNSN officials.

## (d). WNSN Officers' Response to Crime Incident.

**Table 7: WNSN Officers' response to crime incident.**

Variable	Frequency	Percent	Cumulative Percent
Very good	258	59.4	59.4
Good	127	29.3	88.7
Average	38	8.8	97.5
Poor	9	2.1	99.5
Very poor	2	.5	

When 434 respondents of the online survey were asked: how rapidly the WNSN officers respond to crime incidents, 88.7% (59.4%+29.3%) indicated that the WNSN officers respond rapidly to incidents while less than 3% indicated that their response is poor. Response to incidents is one of the major issues for all police (all security actors) because of its unique impact on victims as well as the community. It can be used to measure the race towards making UN-SDG 16 achievable. See Table 7 and Figure 4.

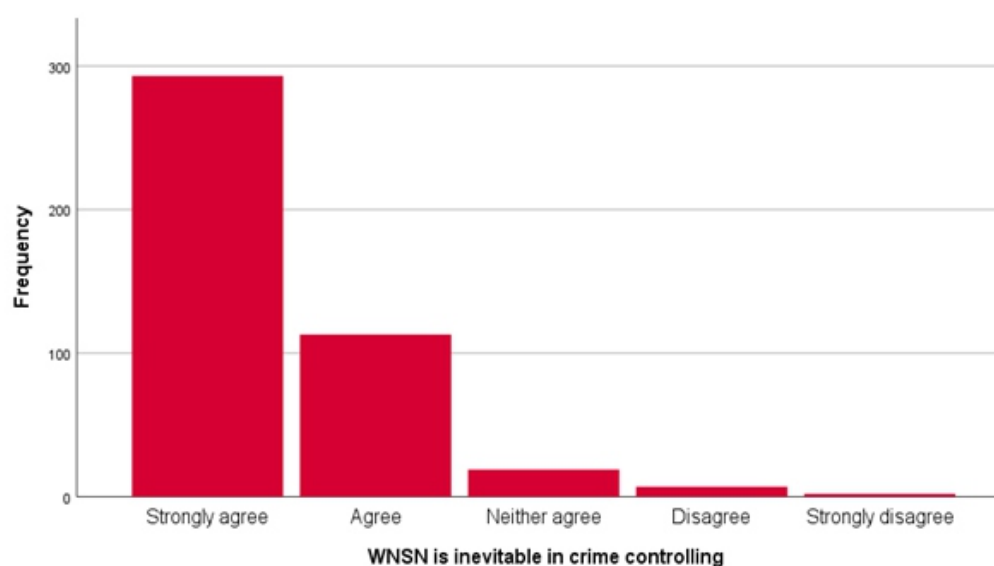
**Figure 4: WNSN Officers' Response to Crime Incident**

(e). Crime Controlling and Advancing the Cause of Peace in the region.

**Table 8: WNSM is inevitable in terms of crime control in the region**

Variable	Frequency	Per cent	Cumulative Percent
Strongly agree	293	67.5	67.5
Agree	113	26.0	93.5
Neither agree	19	4.4	97.9
Disagree	7	1.6	99.5
Strongly disagree	2	.5	100.0
Total	434	100.0	

In terms of crime controlling and advancing the cause of peace in the region, when respondents were asked if they agree or disagree that WNSN is inevitable, 93.5% majority (67.5% + 26.0) of the respondents emphatically indicated they “strongly agree” and “agree” that WNSN is mostly inevitable in building more peaceful Nigeria to attain the objectives of UN-SDG 16. The table and figure derived from the online survey are depicted in the table and figure presented. Drawing from the data presented in Table 8 and Figure 5, it vividly shows that Table 1, 2 & 3 and Figures 1, 2, and 3 substantially demonstrate that the emergence, exigence, and prominence of WNSN largely support the realisation of the objectives of UN-SDG 16 in Nigeria. It also opines that the Nigeria Police Force alone can no longer exterminate the innumerable security threats and risks that challenge the unity and sovereignty of the



**Figure 5: WNSM is inevitable in terms of crime control in the region.**

## Findings and Conclusion

In short, drawing from the data presentation and analysis, the WNSN is efficiently complementing the role of NPF and other agencies in the Southwest. The WNSN is actively weakening the state monopoly of security provision. People engage more with the non-state security outfit than other security apparatus in the region. WNSN is actively supporting the objectives of SDG 16 through security provision and inclusion. The WNSN is mostly inevitable in building a more peaceful Southwest. The WNSN officials respond rapidly to incidents, and the networking between the Police and WNSN officials is mutually beneficial. In overall, the WNSN has played a crucial role in enhancing security provision in the region. Its community-oriented approach, knowledge of local dynamics, and collaboration with state-owned security agencies have contributed to the overall safety and stability of the region.

## Conclusion

The emergence, exigence, prominence, and role of WNSN as a key player in the regional effort to combat threats and risks, especially kidnapping in southwest Nigeria have been articulated in this article. According to the findings, WNSN has validated the theoretical and empirical framework of the study of non-state security actors. WNSN, as an institution in southwest Nigeria, effectively and efficiently complements the role of formal state-owned security actors, including the NPF, SSS, NSCDC and other law enforcement agencies. WNSN is weakening the state monopoly of security provision in Nigeria. The importance and performance of WNSN, within a short period of its existence, have given rise to similar security networks in other states in Nigeria such as the Katsina State security outfit. As UN-SDG 16 significantly promotes peaceful and inclusive societies for sustainable development, provides access to justice for all and builds effective, accountable, and inclusive institutions at all levels, WNSN functionally supports the objectives of United Nations Sustainable Development Goal 2030.

In a nutshell, Western Nigeria Security Network is largely validating the position of security experts of the International Political Sociologists who have reinforced the benefits of adopting the concepts of security governance as a means of combatting insecurity through the partnership between the state-owned security actors and the non-state security actors, in both Global North and Global South. This study has demonstrated that the partnership of state and non-state security providers, as a new perspective to security challenges, is rapidly and significantly contributing to the United Nations Sustainable Development Goals (SDGs) 2030, specifically in areas of peacekeeping, security, and social inclusion, simply coded UN-SDG 16. Considerably, some limitations are accrued to the adoption of this security approach notwithstanding that the involvement of the non-state security actors in security provision has been largely influencing the achievement of several UN-Sustainable Development Goals, particularly in regions where the state institutions are weak or ill-performing, such as the NPF in Nigeria. However, their strengths outweigh their limitations. Seemingly, non-state security actors (NSAs), WNSN as a good case study, play a significant role in contributing to the United Nations Sustainable Development Goal 16. In conclusion, non-state security actors are more than complementing the state security actors, they are weakening the state monopoly of security provision at the speed of light.

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### 3. **Effective Inclusive Communication Strategies for Unity, Peace, And Progress for Sustainable Development in Nigeria**

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#### **Abstract**

The current state of the Nigerian nation expressly portends the necessity for national reconciliation and peace-building strategies to enhance the development and sustainability of the nation. From a semantic perspective, this research examines inclusive communication strategies that could be implemented to consolidate the unity, peace, and progress of the Nigerian nation. The method of this research is qualitative. The methodological paradigm is interpretive, based on content analysis. The significance of this research project is its relevance for national synergy and advancement.

#### **Keywords:**

Semantics; Inclusive Communication Strategies; Unity; Peace; Progress; Development; Nigeria

#### **Introduction**

The potency of positive communication is so relevant to the actualization of progress and sustainable national development that this research aims to investigate, from a semantic perspective, the inclusive communication strategies that could propel manifestations of unity, peace, and progress, coupled with security and development, in the Nigerian nation.

Adedimeji (2023) points out that for life to be made meaningful, peace, security, and development are critical. He also notes that for peace, security and development to be achieved, studies in language, literature and communication play significant roles. So, the focus of this research on projecting inclusion strategies through effective communication is relevant to achieving unity, peace, and progress for sustainable development in Nigeria.

Every situation that threatens the peace of a nation results in insecurity, which consequently harms the development of the nation. To the extent that language is a powerful means used to create, maintain, and sustain social harmony, then, appropriate language skills should be adopted to foster unity, peace, and progress for sustainable development in Nigeria.

Corroboratively, Ogunsiji (2023) notes that language is a tool that can be used to maintain and sustain mutual understanding among members of society because it is the key to the heart of the people. Moreover, Olerede & Olorede (2015) point out that language must be consciously used to achieve peace because human perception and conception are conveyed through language in the form of messages, and messages are

transformed into meanings.

Essentially, it is important to emphasize that words have power and can influence the psyche and mindset of the people. In this connection, language must be used appropriately and never misused, to avoid conflicts which could cause upheaval and destruction of lives and properties, thereby mitigating development in the nation. So, proper use of language should be adopted to achieve the needed unity, peace, and progress for sustainable development in Nigeria.

### **Communication, Peace, Security And Development**

The security challenges prevalent in Nigeria show that there is a pressing need to safeguard security and address insecurity in the nation. Invariably, no nation develops amidst conflicts, violence, terrorism, and insecurity. Therefore, the promotion of peaceful communication is an effective strategy to entrench the peaceful conditions required to establish security and progress in the nation.

Ewetan & Urhie (2014) point out that insecurity, in any form it is experienced, constitutes a serious threat to lives and properties, hinders business activities, and discourages domestic and foreign investors, all of which retard a country's socio-economic development.

So, to combat the consequences of insecurity in Nigeria, this research highlights the importance of promoting peaceful co-existence in the nation to achieve the needed security required for progress and sustainable development. The relevance of peace in national development is such that it is pivotal to creating stability and social cohesion that facilitate advancement.

The online *Merriam-Webster Dictionary* describes peace as follows:

1. A state of tranquility or quiet: as (a): freedom from civil disturbance. (b): a state of security or order within a community provided for by law or customs.
2. Freedom from disquieting or oppressive thoughts or emotions.
3. Harmony in personal relations.
4. (a): a state or period of mutual concord between governments. (b): a pact or agreement to end hostilities between those who have been at war or in a state of enmity.
5. Used interjectionally to ask for silence or calm or as a greeting or farewell – at peace: in a state of concord or tranquillity.

Several perspectives of peace have been expressed by different peace scholars over time, across the globe. For instance, as presented by Sandy and Perkins, Jr. (2008: 1), Albert Einstein's popular view of peace states:

Peace is not merely the absence of war but the presence of justice, of law, of order – in short, of government.

Kin (2008: 83) explicates the meaning of peace as advocated by a famous human rights activist, Martin Luther King, Jr., that states:

True peace is not merely the absence of tension: It is the presence of justice.

Adedimeji (2023) describes the concept of peace as a state of harmony characterized by a lack of



violence, conflict behaviours, and freedom from fear of violence.

Distinctively, peace is a state marked with the presence of justice, good law and order, respect for human rights, prevailing security of public places, absence of war or other hostilities, a pact or treaty to cease hostilities, freedom from conflicts or disputes, absence of violence, absence of anxiety or mental stress, harmonious relationships, and good government. Interestingly, all the various manifestations of peace are entrenched through communication.

Inherently, to achieve peace and security for sustainable national development, effective communication is paramount through the appropriate use of language. The capacity to communicate is a vital feature of humans and it influences all human activities. Communication is the act of giving, receiving, and sharing ideas, information, signals, messages, or expressing emotions through a medium. The process of communication involves sending and receiving messages through verbal and non-verbal methods. Communication is cyclical, so it is a two-way means of exchanging information, ideas, thoughts, opinions, and messages between two or more individuals to build an understanding based on accurate comprehension.

Communication is carried out through language skills such as speaking, listening, writing, and reading, with words as the building blocks. From a semantic perspective, there are various types of meanings that words generate which could be conceptual, connotative, social, affective, reflective, collocative, and thematic. Irrespective of the types of meanings that words constitute, words significantly impact communication.

Words are so powerful that they could be used to either build or destroy any nation. Therefore, for unity, peace, and progress to be established in a nation, positive words should predominate the communication dynamics of the polity to align the people's mindset positively, as well as foster the degree of security required for sustainable national development. Semantically, the conceptual meanings of positive words such as love, peace, protection, provision, empowerment, justice, unity, equality, success, progress, prosperity, respect, value, integrity, dignity, etc., denote powerful expressions that significantly influence the psyche of individuals in the right and wholesome direction. Such efficacious expressions promote security and generate positive motivations for nation-building and sustainable development. On the contrary, the conceptual meanings of negative words such as oppression, corruption, tension, protest, crisis, threat, violence, attack, kill, displaced, hijack, bandits, terrorism, insurgency, kidnapping, etc., instil fear, anxiety, depression, frustration, despondency, in the psyche of individuals and cause destruction, as well as escalate insecurity, which hinders national development.

So, to achieve peace, security, and development, it is critical to intentionally use positive words to communicate appropriately, especially through the media which significantly impact the populace. The media, both traditional and new, are strong channels of communication that could be used to build unity and peace in the nation.

### **Inclusive Communication Strategies, Unity, Peace, And Development**

An inclusive approach to peacebuilding strongly encourages people to express their perspectives, without being marginalized, devalued, discriminated against, or excluded from activities that pertain to the nation. One of the inclusion strategies to promote national unity is through peaceful communication couched with appropriate use of language. Proper language use fosters social cohesion and unity which invariably creates

a suitable environment for progress and development in the nation.

Intrinsically, peaceful communication is a constructive nonviolent means to prevent violence, manage conflicts through conflict resolution and transformation mechanisms, as well as promote post-conflict reconciliation. Peaceful communication is relevant at all levels of society to establish and sustain harmonious relationships among people, across ethnic, religious, gender, class, national, and racial boundaries.

In explicating nonviolence, Gandhi (2003) asserts that:

Nonviolence means allowing the positive within you to emerge. Be dominated by love, respect, understanding, appreciation, compassion, and concern for others rather than the self-centered, selfish, greedy, hateful, prejudiced, suspicious, and aggressive attitudes that dominate our thinking.

According to Rosenberg (2003), Nonviolent Communication (NVC), could be summarized thus:

NVC helps us connect with each other and ourselves in a way that allows our natural compassion to flourish. It guides us to reframe the way we express ourselves and listen to others by focusing our consciousness on four areas: what we are observing, feeling, and needing, and what we are requesting to enrich our lives. NVC fosters deep listening, respect, and empathy and engenders a mutual desire to give from the heart. Some people use NVC to respond compassionately to themselves, some to create greater depth in their relationships, and still others to build effective relationships at work or in the political arena. Worldwide, NVC is used to mediate disputes and conflicts at all levels.

On the platform of the United Nations Academic Impact (un.org), Seid (2019), in discussing the topic titled “Unlocking your Emotions to Achieve the SDGs: Nonviolent Communication”, states that:

Nonviolent Communication is a tool that guides practitioners in reframing how they express themselves, how to hear others and resolve conflicts by focusing on what they are observing, feeling, needing, and requesting. It is a tool that leads us toward a compassionate connection between people in which everyone's needs are valued and are met through collaboration.

Through Nonviolent Communication, conflict resolution becomes easier, avoiding simple disputes and resolving difficult ones more effectively. Nonviolent Communication is highly connected with Emotional Intelligence because it relies on people understanding their own emotions and motivations as well as understanding and empathizing with the needs of others.

Peaceful communication promotes positive social change through empathic connection and cooperation

with others, thereby transforming our hitherto reactions and responses to life. Strategically, peaceful communication encompasses crucial aspects of peacebuilding that engender sustainable peace required for national development, which this research presents as follows:

- Refrain from hate speech.
- Avoid conflictual language.
- Abstain from abusive language.
- Desist from verbal violence and threats.
- Avoid acts that threaten people's face or social image.
- Desist from negative ethnic stereotypes.
- Refrain from discriminatory language.
- Abstain from derogatory language.
- Keep away from divisive language.
- Avoid fake news.

Inclusive communication strategies that should be adopted to mitigate conflicts and face threatening acts, and violence is the engagement of meaningful and impactful dialogue entrenched in empathy and compassion towards others. Ogunsiji (2023) points out that dialogue is a process, a deliberate, planned, and sustained conflict intervention effort where people commit to listen, reflect, and question with a curious mindset to seek a shared understanding in situations that touch on peace and security.

Fundamentally, dialogue fosters mutual understanding and facilitates mutual agreement and consensus between conflicting parties. Dialogue helps to dig out the grievances of conflicting parties with the target to resolve the conflicts, restore respect and dignity, and ultimately achieve peace and security for sustainable national development.

Dialogue could be deployed to activate the following peace-building processes:

- Negotiation.
- Intervention.
- Reconciliation.
- Adjudication.
- Prosecution.

In addition to the appropriate use of language, peaceful communication derives much relevance from Dell Hymes' ethnography of communication which stipulates that people must know what to say when to say it, where to say it, and how to say it.

Moreover, positive expressions that advance nationality and instil patriotism in the psyche of the populace should be encouraged and emphasized as an effective inclusive communication strategy. For instance, Nigerians should first define themselves as being Nigerian, before ethnic considerations, to promote unity and peace. In this connection, this research strongly recommends the following powerfully unifying expression:

**I'm a Nigerian.**

Emphasis should be on inclusion strategies rather than divisive diversity, to achieve the suitable degree of unity, peace, and progress for sustainable national development.

## CONCLUSION

Although Nigeria is highly multiethnic, and the ethnic groups and cultures should be preserved, however, the national unity should not be undermined. The requisite unity and peace could be achieved

through the adoption of the effective inclusive communication strategies discussed in this research. It is when there is unity and peace that there will be progress and sustainable development in Nigeria. Further studies on the relevance of inclusive communication strategies are strongly recommended.

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#### 4. Social Inclusion of People with Disabilities in Nigeria

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##### Abstract

Accessibility is indeed a precondition for people with disabilities to enjoy their human rights as it ensures that they have the same opportunities and choices as others. Without accessibility, many rights such as the right to education, work, health and freedom of expression, become inaccessible or out of reach for people with disabilities. Even the possibility of accessing justice by seeking redress and obtaining remedies for infringement of rights would be impeded. Using a doctrinal research methodology, the paper explored the access impediments to social services for persons with disabilities in Nigeria. The paper found that the problem of accessing social services is an even bigger challenge for people with disabilities. Inaccessible physical environments, inadequate assistive technology or rehabilitative devices, and poor services, systems, and policies continue to hinder the access of persons with disabilities to social services in Nigeria. The paper therefore recommended, among other things, that to develop an intervention that is effective in promoting the access of people with disabilities to social services, it is necessary to have a comprehensive understanding of the potential impediments to such access and the influence they have on it. There is also a need to mainstream disability into development policies and social services, as this promotes inclusion and addresses the barriers that prevent people with disabilities from accessing these services.

**Keywords:** Access, Impediments, Persons with Disabilities, Social Services, Nigeria.

##### Introduction

Disability is a global phenomenon that transcends geographical, cultural, religious, gender and socioeconomic boundaries. Its prevalence and incidence are high around the world making it crucial to promote and protect the rights of people with disabilities (Haruna, 2017). According to recent estimates, more than one billion people worldwide are disabled with approximately 190 million of them living with severe disabilities, many of those affected live in developing countries including Nigeria, where an estimated 25 million people have one form of disability, making up about 15% of the population (Ayub & Abubakar, 2022). Persons with Disabilities often face obstacles in many aspects of their lives, including schools, families, banks, and other public places. This can lead to adverse socioeconomic outcomes, such as limited access to education and jobs, increased poverty rates and poor health. The World Bank (2019) has found that people with disabilities are more vulnerable to abuse, neglect, exploitation and crime than people without disabilities. Similarly, people with disabilities often have limited access to basic amenities and live independently from others in society (Ibid). In fact, access to social services is crucial for facilitating social inclusion and upholding the fundamental human rights of people with disabilities. Ensuring access to social services will help to promote and protect the rights of people with disabilities which are essential for achieving the goals of the sustainable development agenda 2030.

People with disabilities often face several barriers that prevent them from accessing social services, such as inaccessible buildings, transportation or information. These barriers may be physical such as buildings that are not accessible to those who use wheelchairs or crutches, or they may be mental, social or financial. Ojo found that patients with disabilities often feel disconnected and marginalized by the way they are treated as passive recipients of social support, rather than as active members of society who deserve basic needs like everyone else. According to Ojo (2017), the disjointed feelings experienced by people with disabilities are related to a lack of access to not just public infrastructure, but also information and communication technology, public policies, electoral system, transportation systems, employment opportunities, educational opportunities, housing and

health care. As Ayub and Rasaki (2021) observed, the lack of access to these basic needs and social services can have a significant negative impact on the quality of life of people with disabilities, including their ability to exercise their rights and live productive lives.

Nigeria has shown its commitment to promoting the well-being of persons with disabilities by ratifying the Convention on the Rights of Persons with Disabilities and enacting the Discrimination against Persons with Disabilities (Prohibition) Act. These legal instruments require that all public buildings be accessible to persons with disabilities and outlaw all forms of discrimination based on disability. Despite the legislation that exists at the international and national levels to protect and promote the rights of people with disabilities, there are still gaps in providing equal opportunities for persons with disabilities to access social services in Nigeria.

### **The Concept of Disability**

Disability refers to a broad range of conditions that impair an individual's ability to perform certain activities or participate fully in society. Disabilities are not just one form but are multidimensional. Physical disabilities, such as paralysis, amputation, or chronic health issues like arthritis or multiple sclerosis, can limit mobility or physical functioning and range from mild to severe. Intellectual disabilities, including Down syndrome or Fragile X syndrome, impact cognitive functioning and adaptive behaviour, influencing learning, reasoning, and problem-solving skills (Centers for Disease Control and Prevention, 2023). Developmental disabilities, such as autism spectrum disorder (ASD) and cerebral palsy, emerge early in life and can affect multiple areas of development, including physical, social, and cognitive domains (National Institute of Child Health and Human Development, 2022).

Learning disabilities, such as dyslexia, dysgraphia, or dyscalculia, manifest as specific difficulties with reading, writing, or mathematics, significantly affecting academic achievement and daily activities (Learning Disabilities Association of America, 2023). Sensory disabilities, like hearing or visual impairments, involve the partial or complete loss of one or more senses, impacting communication, access to information, and navigation (American Foundation for the Blind, 2023). Mental health disabilities, such as depression, anxiety disorders, and schizophrenia, affect emotional regulation, thinking, and behaviour, leading to significant impairments in daily functioning and social relationships (National Alliance on Mental Illness, 2023).

Invisible disabilities, such as chronic pain, chronic fatigue syndrome, or epilepsy, are not immediately apparent but can be equally debilitating, affecting daily life and independence (Invisible Disabilities Association, 2023). Communication disabilities, including aphasia or stuttering, impact the ability to speak, understand, or use language effectively, often resulting from brain injuries, neurological disorders, or developmental issues. Additionally, multiple disabilities can occur simultaneously, compounding challenges and necessitating comprehensive support and accommodation.

The impact of disabilities is further shaped by social and environmental factors, including societal attitudes, cultural norms, accessibility, and the availability of support services. Recognizing the multidimensional nature of disabilities is crucial for developing inclusive policies and practices that ensure accessibility, equity, and full participation in all areas of life. By embracing this perspective, society can work toward removing barriers and creating environments where everyone could thrive and contribute meaningfully.



## **Defining Social Services and People with Disabilities**

Social services are services designed to meet basic human needs for food, shelter, clothing, healthcare, economic security, and education. They also include services that help individuals develop their capabilities, such as job training and placement services (Gray, 2016). In addition to the services mentioned above, social services also refer to a wide range of programs and services provided by governments and other organizations to meet the needs of individuals, families, and communities. These programs and services aim to improve individuals' quality of life and help them become more self-sufficient.

People with disabilities on the other hand are those who experience limitations in their ability to function or participate in society due to physical, mental, or other health conditions that can be caused by genetic factors, environmental influences, accidents or diseases. According to the United Nations Convention on the Rights of Persons with Disabilities, a person with a disability is someone who has long-term physical, mental, intellectual, or sensory impairments that can hinder their full and effective participation in society when interacting with various barriers (CRPD, article 1). The World Health Organization (2011) defines persons with disabilities as those who have long-term physical, mental, intellectual or sensory impairments whose interaction with various barriers may hinder their full and effective participation in society on an equal basis with others. Thus, a person with a disability is defined as someone who is unable to fully or partially meet their own basic needs and is unable to participate fully in the community due to physical, mental, emotional, or sensory limitations. Disability is therefore a complex and multi-faceted term that encompasses impairments, activity limitations and participation restrictions (Onalu & Nwafor, 2021).

## **The Importance of Access to Social Services for People with Disabilities**

Access to social services is vital for people with disabilities, as it can help them to live independently and participate fully in society. The World Health Organization (WHO) states that access to healthcare, education, employment, and social support are all important factors in promoting the health and well-being of people with disabilities. The Convention on the Rights of Persons with Disabilities (United Nations, 13 December 2006) makes accessibility an overarching principle, which means that it applies to all aspects of the Convention, including healthcare, education, employment, and social support (CRPD, Article 3). Rimmer and Newcomer (2014) found that access to healthcare, education, and social support has a significant impact on the quality of life and well-being of people with disabilities. The study also found that people with disabilities who have access to these services are less likely to experience poverty and isolation and are more likely to be employed and participate in their communities (Rimmer and Newcomer, 2014). Access to social services can promote social inclusion and reduce the risk of social isolation and exclusion (Wehman, et al., 2014). It is not only important for individuals with disabilities, but also for their families and caregivers. Studies have shown that people with disabilities who have access to healthcare and social support are less likely to experience depression, anxiety, and other mental health problems. They are also more likely to have better physical health, including improved cardiovascular health and lower rates of obesity (Wehman, et al., 2014). Additionally, access to education can

help people with disabilities gain the knowledge and skills they need to live independently and participate in their communities (National Council on Disability, 2018).

Moreover, research has shown that when people with disabilities have access to employment and other economic opportunities, it can lead to increased productivity and reduced costs for government programs. For instance, a study by the Institute for Women's Policy Research found that increasing the employment rate of working-age people with disabilities from 29% to 54% could reduce government spending on disability benefits by \$23.2 billion per year (Gustafson & Mueller, 2020). In addition to reducing Federal spending, access to social services can also reduce the family caregiving burden (Martire et al, 2005). It can reduce the number of hours that family members spend providing care and increasing satisfaction for both family members and persons with disabilities. This benefit can be particularly important for family caregivers, who often face significant stress and burden when providing care.

Indeed, access to social services is essential for improving the lives of people with disabilities and their families. By reducing caregiving burden, increasing economic opportunities, and promoting health and well-being, access to social services can make a positive difference for all involved.

### **Rights of People with Disabilities to Access Social Services**

Persons with disabilities have the same right to access social services as anyone else. These are not extra rights, but rather fundamental human rights that should be available to all people; regardless of whether they have a disability or not. This includes the right to access health care, education, employment opportunities and social support on an equal basis with others.

### **Healthcare Services**

The right to health is a well-established right under international human rights law, including the International Covenant on Economic, Social and Cultural Rights (ICESCR). ICESCR recognizes the right of all people to enjoy the highest attainable standard of physical and mental health (ICESCR, Article 12). The Convention on the Rights of the Child also requires state parties to recognize the rights of children with disabilities to specific assistance to ensure their effective access to health care and rehabilitation services in a manner conducive to the Child's achieving the fullest possible social integration (CRC, Article, 23). Furthermore, Article 25 of the Convention on the Rights of People with Disabilities affirms the right of persons with disabilities to the enjoyment of the highest attainable standard of health. This includes access to preventive, curative and rehabilitative health services, as well as to health-related services. The Article also specifies that states must take all appropriate measures to reduce infant and child mortality, provide clean water and sanitation, and combat diseases and malnutrition. Additionally, Article 25 calls for the provision of health-related information, education, and training to health professionals.

The right to health as outlined in Article 25 of the Convention must be interpreted in the light of the principles of the Convention outlined in Article 3. Article 3 of the Convention outlines the guiding principles, including respect for inherent dignity, individual autonomy, and non-discrimination. These principles should be taken into consideration when interpreting the right to health as outlined in Article 25. Section 21 of the Discrimination against Persons (Prohibition) Act, 2018 also requires that health services be provided in a manner that is

accessible to persons with disabilities. This includes ensuring that health facilities are physically accessible, and that communication is accessible. Thus, the right to health includes access to vital public health programmes and to rehabilitation services, including residential care, community-based care and support services provided based on free and informed consent.

### **Educational Services**

It is widely acknowledged that all children, regardless of their nationality, colour, religion, culture, background, or disability, have the right to an education. The right of people with disabilities to access high-quality education is a manifestation of their fundamental human rights, which are protected by both national and international law. According to section 17 of the Discrimination against Persons with Disabilities (Prohibition) Act, persons with disabilities have a right to education free from discrimination or segregation at any level, including the right to free education up to secondary school. In addition, the Act stipulates that all public educational institutions must be inclusive and accessible to people with disabilities. They must have trained personnel to provide for the educational needs of people with disabilities. Moreover, the curricula of primary, secondary and tertiary institutions must include Braille, sign language, and other skills for communicating with people with disabilities (Ibid, section 18). These provisions are designed to ensure that people with disabilities can live dignified, self-sufficient lives and actively participate in community development. The Act also mandates subsidized education for special education personnel (Ibid, sections 18-19). These measures will go a long way in promoting integration and communication with persons living with disabilities in Nigeria. The United Nations Convention on the Rights of the Child which Nigeria has ratified, explicitly states that children with disabilities have the right to education on an equal basis with other children and that their education should be free from any discrimination (CRC, Article 28). Similarly, the Protocol to the African Charter on Human and People's Rights on the Rights of Persons with Disabilities affirms the rights of children with disabilities to education, without discrimination (Article 3). Moreover, Sustainable Development Goal 4 focuses on inclusive and equitable quality and promotion of lifelong learning opportunities for all, including the elimination of gender disparities in education and ensuring equal access to all levels of education and vocational training, especially for vulnerable groups such as people with disabilities. Additionally, the proposal calls for building and upgrading education facilities that are child, disability and gender sensitive and that create safe, non-violent, inclusive and effective learning environments. Indeed, the right to education in all, including persons with disabilities, is a fundamental human right that must be protected and promoted.

### **Employment Opportunities**

Employment is central to the ability of people with disabilities to maintain a decent standard of living for themselves and their families and is a crucial factor influencing their ability to fully participate in society. Work is a defining feature of human existence and is viewed as a way for people to make individual contributions to their communities. For many people, work is a source of identity and a way to participate in society. However, for people with disabilities, barriers to employment can significantly limit their ability to participate in society. The Discrimination against Persons with Disabilities (Prohibition) Act provides that persons with disabilities have the right to work on an equal basis with others. This includes the right to access opportunities to earn a

living through freely chosen or accepted work in a labour market and work environment that is open and accessible to all (DAPDA, section 28). This means that employers regardless of disability could apply for and be considered for jobs. Employers must not make hiring decisions based on the applicant's disability, but rather on their skills and qualifications. A person discriminating against a person with a disability in the employment process is liable to a minimum fine of N250,000.00 (two hundred and fifty thousand Naira) which will be paid to the affected person with a disability (Ibid, section 28 (2)). Any company found to violate this provision will be liable to a minimum fine of N500,000.00 (Five hundred thousand Naira) and any principal officers of the company found to have been involved in the discrimination will be liable to an additional fine of N50,000.00 (fifty thousand Naira) (Ibid, section 28 (3)). Section 29 of the Discrimination against Persons with Disabilities (Prohibition) Act also requires all employers in public organizations to have at least 5% of their workforce made up of people with disabilities. This provision is intended to ensure that people with disabilities have access to equal employment opportunities and are not excluded from the workforce.

The Convention on the Rights of Persons with Disabilities, like the Discrimination against Persons with Disabilities (Prohibition) Act, affirms the right of people with disabilities to work on an equal basis with others. This includes the right to work in a labour market that is open, inclusive, and accessible to people with disabilities (Article 27). The Convention on the Rights of Persons with Disabilities directs state parties to prioritize non-discrimination laws, accessibility, reasonable accommodation, and positive measures as means of implementing the right to work for people with disabilities. Article 27 of the Convention encompasses access to general technical and vocational guidance programs, placement services and vocational and continuing training, as well as the promotion of vocational and professional rehabilitation. Similarly, Sustainable Development Goal 10 seeks to reduce inequality within and among countries by empowering and promoting the social, economic and political inclusion of all, including people with disabilities.

## **Social Support**

The rights of persons with disabilities to access social support are outlined in the United Nations Convention on the Rights of Persons with Disabilities (CRPD), which has been ratified by Nigeria. According to the UNCRPD, people with disabilities have the right to enjoy access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and services open or provided to the public (CRPD, Article 9). In addition to the rights outlined in the Convention on the Rights of Persons with Disabilities, the Discrimination against Persons with Disabilities (Prohibition) Act of Nigeria, which is based on the Convention on the Rights of Persons with Disabilities, outlines the rights of persons with disabilities to social support. These include the right to health, education, vocational training, employment and rehabilitation (DAPDA, section 17). The Discrimination against Persons with Disabilities Act also guarantees equal access to public buildings, transportation, and communication services (DAPDA, section 19). All public buildings must be fitted with ramps and other facilities that make them accessible to and useable by people with disabilities. (DAPDA, section 57). The Act further requires that all public sidewalks, pedestrian crossings, and all other facilities that are open to the public must be made accessible to and usable by persons with disabilities, including those who use wheelchairs and those who are visually

impaired (Ibid, section 5). The Act allows for a five-year transitional period for public buildings and structures to be modified to be accessible to and usable by persons with disabilities (Ibid, section 6). It also requires that all building plans be reviewed by the appropriate authority responsible for approval to ensure compliance with accessibility standards. It is an offence for an officer to approve a building plan that does not meet these requirements (Ibid, section 7). The right to social support for people with disabilities therefore includes a range of services and support that enable them to live in the community and participate in society. Despite legal protections, many persons with disabilities in Nigeria continue to face significant barriers to accessing social services.

### **Access Impediments to Social Services for People with Disabilities in Nigeria**

People with disabilities face a variety of barriers when accessing social services including physical, attitudinal, and institutional barriers. These barriers have a significant impact on the quality of life of people with disabilities and their families.

#### **Physical Impediments**

These refer to physical barriers present in the environment that prevent people with disabilities from accessing social services. They include inaccessible buildings, a lack of ramps or elevators, and a lack of Braille or audio signage. Lack of access to infrastructure like houses, offices and churches makes it difficult for people with disabilities to participate in society. Physical barriers like narrow doorways, inaccessible toilets, and lack of ramps make these structures inaccessible (Thompson, et al, 2021). Several barriers make hospitals inaccessible to people with disabilities. For example, there is a lack of ramps, narrow doorways, and inaccessible toilets (Mbada et al, 2021). These barriers pose challenges in accessing medical services and contribute to inequality in the system of treating patients. Thus, Persons with disabilities often face difficulties in accessing health services, such as limited availability of accessible hospitals and health personnel who are trained to provide services that are inclusive of people with disabilities. There is a lack of accessible information on disease prevention and symptom identification in Braille and large print formats, making it difficult for people with vision impairments to learn about health issues and take preventive measures. This lack of information can lead to increased health risks for people with vision impairments. The Center for Disease Control and Prevention (CDC) has noted that accessible health care requires both communication accessibility, such as sign language interpreters, and physical accessibility, such as accessible restrooms and entrances. However, people with disabilities, particularly those who are deaf, have speech or vision impairment, or have an intellectual disability, often face barriers to accessing effective healthcare services.

In addition to difficulty in accessing healthcare services, people with disabilities also face poor educational outcomes due to a lack of accessible infrastructure and learning materials. Furthermore, the buildings at tertiary institutions are often not constructed with the needs of people with disabilities in mind. These buildings, like many other public buildings, are not accessible to people with disabilities. Children with visual impairments often struggle to learn in school due to the lack of accessible materials, such as Braille materials and textbooks. Also, the high cost of accessible textbooks presents an additional challenge for visually impaired children from low-income families. As a result, blind students often rely on friends to dictate assignments, notes, and even textbooks to them, to comprehend and participate in class activities (Ojo, 2019). In addition to household

poverty, other barriers to educational access include inaccessible physical structures, a lack of appropriate information format, in-class communication support, a lack of assistive technology, and discrimination (Kett, 2017).

Moreover, a lack of accessible transportation systems further discourages the social inclusion of people with disabilities. The lack of assistive technologies and other resources to support people with disabilities prevents them from fully integrating into the mainstream of society. In a study of six Nigerian cities (Bauchi, Enugu, Kano, Lagos, Rivers and Abuja), Odufuwa (2017) found that many persons with disabilities have limited or no access to public transportation. This barrier hinders their daily activities and prevents them from fully participating in urban life. The poor state of public transportation services in Nigerian cities forced persons with disabilities to spend additional money on hiring a professional attendant when making trips. Persons with disabilities who use wheelchairs, walking sticks, and other mobility aids often cannot use public transportation in Nigerian cities. (United Nations, 2007). For example, Fatimah Aderonmu, a 24-year-old woman who lost the use of her limbs in childhood, faces daily challenges in accessing social services. According to Aderonmu, (as cited in Abolade, 2021) the lack of wheelchair accessibility on pedestrian bridges makes it impossible for her to use public transportation. With a wry smile, she said:

Now that I use a wheelchair, I just avoid pedestrian bridges. I can't make use of public means of transportation because they are inaccessible. I prefer to go out in private vehicles or use cab-hailing services and this comes with high financial implications because even though I stay in Ogun State, most of my activities take place in Lagos.

In addition to a lack of accessible transportation, persons with disabilities in Nigeria face many barriers to accessing public buildings. There is often no wheelchair access at street crossings, and public buildings often lack accessible facilities. Affordable and practical mobility aids are also scarce. The lack of accessible transportation and public facilities presents significant challenges to persons with disabilities in Nigeria. These barriers not only make it difficult for people with disabilities to move around and access basic services, but also create a sense of isolation and exclusion.

### **Attitudinal Impediments**

Attitudinal impediments are the result of society's negative perceptions and attitudes towards people with disabilities. It is no secret that people with disabilities often face prejudice and discrimination against others. This perception is not inclusive and does not consider the experiences and needs of people with disabilities. As a result, persons with disabilities face stigmatization and discrimination and are often denied the dignity and opportunities they deserve. Society's perception of people with disabilities as objects of charity, rather than as full and equal members of society, only compounds the problem. The LINKS Sector Scan has identified attitudinal impediments as the most significant barrier to employment for people with disabilities due to a lack of understanding and knowledge about disability (LINKS, 2021). One of the most common attitudinal impediments is when individuals focus only on a person's impairment, rather than seeing them as a whole person. Almost one-third of people with disabilities reported that they receive negative feedback or inadequate attention from potential employers after disclosing their impairments (Ibid). In addition, people with disabilities

often experience stigma and discrimination because of their disability. Many people in society have a lack of understanding or awareness about people with disabilities, which can lead to misunderstanding and stereotypes. Some people also believe that they are not capable of certain activities or are a burden on society.

Furthermore, healthcare providers often make their services inaccessible and discriminate against patients with disabilities. This is due in part to a lack of basic knowledge about human rights and the right to healthcare among many healthcare workers. As a result, people with disabilities often have difficulty accessing healthcare services. People with disabilities face often discrimination and denial of medical attention at rural and urban centers, where they may be treated with disdain by healthcare workers. This discrimination is based on their disability and can prevent them from getting the care they need. Attitudinal impediments also affect access to educational services, as Nigeria's educational system separates children with disabilities from those in traditional classrooms. This segregation system reinforces the mistreatment and discrimination of children with disabilities. Additionally, it limits the opportunities available to children with disabilities and reinforces the idea that they are somehow less deserving of a quality education. The segregation system deprives children with disabilities of opportunities for socialization, including isolation, abuse, and neglect. Overall, attitudinal impediments hurt people with disabilities in several areas, including education, healthcare, and employment. These barriers can lead to a cycle of discrimination, mistreatment and neglect, which further isolates people with disabilities from the rest of society. Efforts to address attitudinal barriers must therefore address both the root causes of these attitudes and the systemic issues that perpetuate them.

### **Institutional Impediments**

Institutional impediments are policies, laws, and practices that, even if they are not explicitly discriminatory, have the effect of excluding or disadvantaging persons with disabilities. These barriers may not be intentional, but they still deny people with disabilities access to equal opportunities and full participation in society (WHO, 2021) For example, a person who uses a wheelchair may not be able to enter a financial institution if there is no ramp. Someone with sensory processing issues may struggle to complete their work without reasonable accommodation, such as noise-cancelling headphones. (Elekwe & Ebenso, 2016). The LINKS Sector Scan identified lack of access to capital as the biggest barrier to success for disabled entrepreneurs. It also found that disabled entrepreneurs are not registered with the Corporate Affairs Commission and may not be aware of or be able to afford the costs associated with regulatory standards such as product registration with the National Agency for Food and Drug Administration and Control and therefore do not benefit from government procurement opportunities (LINKS, 2019). According to McColl (2006), the challenges patients with disabilities face in hospitals are systemic, due to policies and hospital management. A lack of qualified doctors and long waiting times for patients are common problems, but even more so for patients with disabilities. McColl further asserted that hospitals often exclude patients with disabilities from special treatments because they are perceived as a burden on the physician's time.

In addition, studies have shown that patients with disabilities face a variety of systematic barriers to accessing good health, less access to adequate healthcare, and riskier health behaviours (Ayub & Rasaki, 2021). Private hospitals are often understaffed, and there may not be enough staff on duty to deal with the needs of patients with disabilities. This can lead to a lack of appropriate services for patients with disabilities, as well as geographical

inequalities in the provision of medical services, caused by the irresponsibility of hospital owners and managers (Ibid). These conditions can be stressful experiences for patients with disabilities from seeking necessary medical care. This can exacerbate their health problems and infringe on their fundamental human rights. Patients with disabilities face many challenges when seeking medical care. Lack of policy frameworks, quality social services and an unequal geographical distribution of services are all institutional impediments that prevent people with disabilities from accessing the social services they need. Without the right policies and services, people with disabilities may not be able to fully participate in society and may experience negative consequences as a result.

### **Conclusion and Recommendations**

The importance of social services for people with disabilities cannot be overstated. International instruments and national legislation, such as the Disability Act in Nigeria, exist to promote access to healthcare, education, employment, buildings, transportation systems and assistive technologies. Despite this, people with disabilities are still a disadvantaged group, with difficulty accessing these services and systems. Based on these findings, the paper, therefore, recommends that to create an intervention that is effective in promoting the access of people with disabilities to social services, it is necessary to identify and understand potential barriers to access and their impacts. Mainstream disability issues are included in all development policies and social services. To be effective, this mainstreaming process should include the participation of people with disabilities in decision-making processes at all levels of government, and at all stages of policy development, including planning, implementation, and evaluation.

Again, Laws that support structural change for persons with disabilities should be implemented in Nigeria, as structural barriers are a major challenge to accessing services for this population. The Discrimination against Persons (Prohibition) Act 2018 should be amended to include specific provisions for transportation security for persons with disability. National councils on disability should be established, including representation from all disability groups in the country. The charity model of disability, in which people with disabilities are viewed as passive recipients of help, should be replaced with a new model that views people with disabilities as active contributors to the economy. To shift from a charity model to a rights-based model, stakeholders such as the local private sector, civil society organizations, and governments should collaborate on initiatives that build awareness of the rights-based model. There is also the need to provide assistive devices, skills, and training for people with disabilities. Promote inclusive environments in schools. Build more barrier-free transportation systems and plan new systems with the perspectives of people with disabilities in mind. This will involve understanding the different circumstances that create barriers for people with disabilities.

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## SESSION THREE: FOCUS ON THE PLANET (SDG 13, 14, and 15)

### 1. Environmental Pollution and Radiological Hazards Assessment of Quarrying Activities in Southwestern Nigeria

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#### Abstract

The introduction of pollutants to any environment poses a significant threat to human health and the overall well-being of ecosystems, thus undermining the Sustainable Development Goal (SDG). In 2019, the World Health Organization (WHO) reported that approximately 9 million annual deaths were attributed to air pollution resulting from human activities. The research investigated radiological pollution hazards caused by quarrying-related dust emissions. The assessment includes estimations of internal hazard index ( $H_{in}$ ), external hazard index ( $H_{ex}$ ), radium equivalent activity ( $Ra_{eq}$ ), absorbed gamma dose rate (D), Annual Effective Dose Equivalent (AEDE), and Excess Lifetime Cancer Risk (ELCR). Two-hundred-gram (200g) of each dried dust sample was placed into gas-tight, radon impermeable cylindrical polyethylene containers with a uniform base diameter of 2cm and then sealed for 28 days to achieve secular equilibrium before using NaI(Tl) gamma-ray spectrometer for counting. The highest activity concentrations of  $1691.9\text{Bqkg}^{-1}$ ,  $55.0\text{Bqkg}^{-1}$ , and  $124.8\text{Bqkg}^{-1}$  were recorded for  $^{40}\text{K}$ ,  $^{226}\text{Ra}$  and  $^{232}\text{Th}$  respectively. Radiological hazard indices were computed and compared with the *International Commission on Radiological Protection (ICRP)* and it was observed to be slightly higher than the standard limit. The results suggested that more attention is required in monitoring dust from quarrying-related activities in the study areas. It emphasizes the inclusion of proper ventilation in residential structures to mitigate the accumulation of radon. Quarrying dust's potential impact on the environment, human health, and Sustainable Development Goal (SDG) has been addressed.

**Keywords:** Quarrying dust, Hazard indices, Health impact, Pollution, Environment

#### Introduction

A pollutant/contaminant is any physical, chemical, biological or radiological substance or matter that hurts air, water, or soil (Babuji *et al.*, 2023). The presence of pollutants in any environment interferes with human health and welfare, thus limiting proper functioning of the human capacity and the environmental system (Manisalidis *et al.*, 2020). Out of thousands of hazardous pollutants, radioactive pollutants are the most toxic (Saleh *et al.*, 2022) because they are all-pervasive, emitting radiation consisting of energetic particles that damage human tissues leading to various health challenges. Natural sources of ionizing radiation have always been part of the human environment; they come from the earth (rocks/ soil) or cosmic (Kormanovskaya *et al.*, 2023). Meanwhile, long-lived radioactive elements including uranium, radium, thorium and non-decay series potassium are present in variable quantity in the earth and their concentration depends on the composition of the soil or rocks within that geographic area.

Environmental pollution can trigger physical illness (Olden *et al.*, 2011) and activate diseases if not controlled. Humans' health depends greatly on the care given to the control of environmental pollution; the more we understand our environment the healthier we live. Even though quarrying activities has created jobs opportunity and economic development, the environmental effects and challenges cannot be neglected (Ipeghan *et al.*, 2019; Ajibade *et al.*, 2022). Typically, air pollution is a major effect caused by quarrying exhibited by releasing dust particles into the atmosphere, which may be carried long distances by wind or rose into the upper levels of the atmosphere where they can cause major worldwide problems. It is disinteresting to note that many health

problems are linked to air pollution. World Health Organization (WHO) in 2019 reported that about 9 million deaths per year was because of air pollution from anthropogenic sources (Giuliani *et al.*, 2021). In addition, Manisalidis *et al.*, (2020) established that respiratory and cardiovascular diseases may result from air pollution problems leading to reproductive and central nervous system dysfunctions, and cancer. Notwithstanding the aforementioned, many authors have provided more thoughts as to the environmental implications and health of quarrying, Ipeghan *et al.*, (2019), investigated the effect of rock crushing on Ishiagu environment in Enugu State, Nigeria, the report found that the air around quarry sites could be contaminated by numerous number of potentially toxic heavy metals which may include iron, zinc, copper, lead, cadmium, chromium and nickel.

Nigeria is blessed with over forty (40) different minerals, according to the National Bureau of Statistics (NBS); about six per center of Nigeria's gross domestic products (GDP) in 2021 was generated from mining and quarrying sector. Despite this huge contribution to national GDP, there are a number of environmental safety measures guiding the operation of mining and quarrying, unfortunately, these safety measures are not the major concerns of the stakeholders in mining and quarrying sectors rather to generate and maximize revenues (Taiwo and Ogunbode, 2024). No adequate measures have so far been recorded by authors in safeguarding the lives of the nearby dwellers, perhaps the environment where most quarries are sited. From the experience of field sampling, eighty percent of the quarry sites are in rural areas where majority of the inhabitants lack or unaware of the adverse effects of the environmental pollution caused by mining and quarrying. Alausa *et al.*, 2015 reported that gamma rays are predominantly emitted by dust emanating from crushed rocks, primarily from isotopes such as  $^{40}\text{K}$ ,  $^{226}\text{Ra}$ , and  $^{232}\text{Th}$  along with their radioactive decay products. Olabamiji *et al.*, (2023) also noted that dust from crushed rocks can also release radon, an inert gas, and its radioactive decay products; this could affect the whole-body, skin and respiratory tract of humans when they are inhaled

This study measured the concentrations of natural radionuclides in some crushed rocks taken from quarry sites, in Southwestern Nigeria using sodium iodide detector (NaI), the detector is preferable in the analysis of natural radionuclide in rock samples due to its relatively higher efficiency and it works under room temperature conditions. The primary aim is to determine the natural activity concentration of primordial radionuclide in dust from some selected quarries.

## **Materials and methods**

### **Geology of the study locations**

The Nigerian geological basement complex is located from between Latitude 4°N and 15°N and Longitude 3°E and 14°E between the Pan-African mobile belt in-between the West African and Congo Craton (Jibiri *et al.*, 2016). Furthermore, the basement complex of Southwestern Nigeria lies between latitudes 7°N and 10°N and longitudes 3°E and 6°E. It is a crystalline basement rock comprising amphibolite, migmatite gneisses, granites, pegmatite and some other important rocks including schist comprising biotite schist, quartzite schist, talc-tremolite schist, and the muscovite schist (Usikalu *et al.*, 2015). In terms of lithology, Osun and Oyo States belong to the crystalline basement complex region, while Ogun State belongs to the basement complex (undifferentiated) region post-cretaceous.

### **Sample collection**

The geological map and features of different types of rocks found in the three states have been carefully studied before the sample collection. Crushed rock dust samples were collected from the site, and quantities of the collected crushed rock dust were packed into polyethylene bags, tied and labeled. The sampling was carried out randomly in five (5) quarry sites in each state. Ten different rocks were collected from each site to make a total of 50 samples for the study. The samples were then taken to the Radiation and Health Physics Research Laboratory at the Department of Physics, Federal University of Agriculture Abeokuta for spectrometry analysis.

### Sample preparation for spectrometry analysis

The crushed rock dust samples were pulverized and homogenized. The sample was sieved with a <0.16mm mesh size before drying in an electric temperature-controlled oven at 110°C temperature for 4 hours to remove moisture (if any). Two hundred (200g) of each of the dried samples was carefully weighed using an electronic balance with a sensitivity of 0.01mg and emptied into a gas-tight radon impermeable, cylindrical polyethylene container of 2cm uniform base diameter and it was then sealed. The container was substantially fit to sit on the 5cm x 5cm NaI(Tl) detector that was used for the measurement. The prepared samples were kept for 4 weeks to allow for a state of secular radioactive equilibrium between  $^{222}\text{Rn}$  and its short-lived decay products ( $^{214}\text{Pb}$  and  $^{214}\text{Bi}$ ).

### Determination of activity concentrations

A 5cm × 5cm solid NaI(Tl) gamma-ray spectrometric that was coupled to a Digital-based multi-channel analyzer (MCA) was used to count the activity concentrations of  $^{40}\text{K}$ ,  $^{226}\text{Ra}$  and  $^{232}\text{Th}$ . The detector has an energy resolution of about 8% at the energy of 0.662 MeV, which was considered adequate to distinguish the gamma energies of interest in the study. However, the activity concentration of  $^{214}\text{Bi}$  determined from its 1.76 MeV gamma ray peak was chosen to provide an estimate of  $^{226}\text{Ra}$  in samples, while that of the daughter radionuclide  $^{208}\text{Tl}$  determined from its 2.61 MeV gamma ray peak was chosen as an indicator of  $^{232}\text{Th}$ . The activity concentration of  $^{40}\text{K}$  was determined from 1.46 MeV gamma-rays emitted during the decay of  $^{40}\text{K}$ . The standard reference sample used for efficiency calibration was from Rocketdyne Laboratories California, USA, traceable to a mixed standard gamma source (RefNo 48722-356) by Analytic Inc., Atlanta, GA, USA.

Equation (1) shows the usual relationship between activity concentration and the count rate under the photo peak of a given gamma-ray spectrometry detector (Jibiri and Akomolafe, 2016)

$$C = \frac{C_n}{\varepsilon_p I_\gamma m_s} \quad (1)$$

where C is the activity concentration of the radionuclides ( $^{40}\text{K}$ ,  $^{226}\text{Ra}$  and  $^{232}\text{Th}$ ) in the sample ( $\text{Bqkg}^{-1}$ ),  $C_n$  is the count rate under the photo peak,  $\varepsilon_p$  is the detector efficiency at a specific gamma-ray energy,  $I_\gamma$  is the absolute transition probability of the specific gamma-ray and  $m_s$  is the mass of the sample.

An empty container of the same geometry as the sample container was counted for the same time to take care of the background radiation count and determination of the radionuclide detection limits. The detection limits (DLs) which describe the operating capability of the detector without the influence of any sample were determined using the Alausa *et al.* (2015) model.

The detection limits (DLs) obtained in the present study was 0.12, 0.14 and 0.40 Bqkg<sup>-1</sup> for <sup>40</sup>K, <sup>226</sup>Ra and <sup>232</sup>Th respectively. The activity concentrations of <sup>40</sup>K, <sup>226</sup>Ra and <sup>232</sup>Th less than the corresponding values of the DLs are referred to as below detection limit (BDL). One-half of each DL is considered for calculating the mean activity concentrations of the radionuclides and the radiological parameters (Alausa *et al.*, 2015)

## Radiological Assessments

### Outdoor absorbed and effective dose rates

The quantity of absorbed dose is the amount of energy per unit mass absorbed by the irradiated object. Absorbed dose is the energy responsible for damage in living organism. The absorbed dose rate (nGyh<sup>-1</sup>) at 1 m above the ground in air is calculated using the expression given by Olabamiji *et al.*, (2023)

$$D_R = 0.462A_{Ra} + 0.604A_{Ra} + 0.0417A_K \quad (2)$$

where  $D_R$  is the absorbed dose rate in nGyh<sup>-1</sup>,  $A_{Ra}$ ,  $A_{Th}$  and  $A_K$  are the respective activity concentrations of <sup>226</sup>Ra, <sup>232</sup>Th and <sup>40</sup>K measured in Bqkg<sup>-1</sup>. However, an annual effective dose is used to assess potential long-term effects that might occur in future due to ionizing radiation exposure of the public. The annual effective dose  $E_D$  (mSvy<sup>-1</sup>) to the public due to the absorbed dose rate in air can be calculated using UNSCEAR (2016).

$$E_D = D_R \times 8760 \times 0.2 \times 0.7 \quad (3)$$

Where  $E_D$  is the effective dose in mSvy<sup>-1</sup>,  $D_R$  (nGyh<sup>-1</sup>) is the dose rate in air, 8760 is the time in hours for one year, 0.2 is the outdoor occupancy factor and 0.7 is the conversion factor Olabamiji *et al.*, (2023)

### Excess lifetime cancer risk

Lifetime cancer risk is defined as an estimate of the risk to a member of a population that is dying from cancer because of exposure to ionizing radiation (IAEA, 2003). The cancer risks due to the external radiation exposure of soils from the dumpsites are determined using a model proposed by the United States Environmental Protection Agency (UNSCEAR, 2016): Lifetime cancer risk assessment (R) was calculated using equation 4

$$R = \sum A_{edr} R_f L_e \quad (4)$$

Where  $A_{edr}$  is the annual effective dose equivalent measured in Svyr<sup>-1</sup>,  $L_e$  is the duration of life (55.2 years for Nigerians) while  $R_f$  (Sv<sup>-1</sup>) is the risk factor according to ICRP (1996), the risk assessment probability coefficient is given as  $7.3 \times 10^{-2}$  Sv<sup>-1</sup>. The results of the lifetime cancer risk are presented in Table 2. From the results, the lifetime cancer risk obtained in the present study were not significant when compared with the world recommendation of  $8.4 \times 10^{-3}$  (UNSCEAR 2016) corresponding to 2.4 mSvy<sup>-1</sup>.

### Radium equivalent

The radium equivalent ( $Ra_{eq}$ ) is commonly used as an index to compare the specific activity concentrations of radionuclides in different sample matrices. It is the sum of the weighted activity of radionuclides based on the



estimation that 130 Bq kg<sup>-1</sup> of <sup>40</sup>K, 10 Bq kg<sup>-1</sup> of <sup>226</sup>Ra and 7 Bq kg<sup>-1</sup> of <sup>232</sup>Th will deliver an equivalent gamma dose rate. It was calculated using the expression below by Agnieszka, *et al.*, (2018)

$$Ra_{eq} = 0.077A_K + A_{Ra} + 1.43A_{Th} \quad (4)$$

Where  $A_K$ ,  $A_{Ra}$  and  $A_{Th}$  are the activity concentrations (Bq kg<sup>-1</sup>) of <sup>40</sup>K, <sup>226</sup>Ra and <sup>232</sup>Th respectively

### External hazard index

The external hazard due to the emitted natural gamma radiation is an important criterion used to assess the radiological suitability of a material for building purposes, and it was calculated using equation 5 (Azeez *et al.*, 2020)

$$H_{ex} = \frac{A_K}{4810} + \frac{A_{Ra}}{370} + \frac{A_{Th}}{259} \quad (5)$$

where  $A_K$ ,  $A_{Ra}$ ,  $A_{Th}$  are the activity concentrations (Bq kg<sup>-1</sup>) of <sup>40</sup>K, <sup>226</sup>Ra and <sup>232</sup>Th, respectively

### Internal hazard index

In addition to the external hazard index, there is also a threat to the human respiratory organs due to <sup>222</sup>Rn, the gaseous decay product of <sup>226</sup>Ra. Internal exposure to radon and its progeny products is quantified by estimating the internal hazard index using Jibiri (201)

$$H_{in} = \frac{A_K}{4810} + \frac{A_{Ra}}{185} + \frac{A_{Th}}{259} \quad (6)$$

where  $A_K$ ,  $A_{Ra}$ ,  $A_{Th}$  are the activity concentrations (Bq kg<sup>-1</sup>) of <sup>40</sup>K, <sup>226</sup>Ra and <sup>232</sup>Th, respectively.

### Gamma index

The gamma index ( $I_\gamma$ ) referred to as the representative index is a hazard parameter used to correlate the annual dose rate due to the excess external gamma radiation caused by any superficial materials. It is used only as a screening tool for identifying materials that might be a threat to human health when used for building construction. The gamma index was calculated using the European Commission proposal Anetai *et al.*, (2022):

$$H_\gamma = \frac{A_K}{3000} + \frac{A_{Ra}}{300} + \frac{A_{Th}}{200} \quad (7)$$

where  $A_K$ ,  $A_{Ra}$ ,  $A_{Th}$  are the activity concentrations (Bq kg<sup>-1</sup>) of <sup>40</sup>K, <sup>226</sup>Ra and <sup>232</sup>Th, respectively.

## RESULTS AND DISCUSSION

### Activity concentrations of $^{40}\text{K}$ , $^{226}\text{Ra}$ and $^{232}\text{Th}$ in samples from the study area

The results of the activity concentration are presented in Table 1. The error observed in each sample is uncertainty from the spectrometry detector while the error attached to each mean value of the activity concentration is the standard deviation.

From Table 1, the activity concentrations of the natural radionuclides in the rock samples ranged from 213.3 to 1573.4 Bqkg<sup>-1</sup> with a mean value of 781.23±10.1 Bqkg<sup>-1</sup> for  $^{40}\text{K}$ ;  $^{226}\text{Ra}$ : 4.9 to 55.0 Bqkg<sup>-1</sup> with a mean of 30.2±6.3 Bqkg<sup>-1</sup> and  $^{232}\text{Th}$  10.4 to 111.0 Bqkg<sup>-1</sup> with a mean value of 49.23±0.02 Bqkg<sup>-1</sup>. Figures 1, 2, 3 illustrates the mean activity concentrations of  $^{40}\text{K}$ ,  $^{226}\text{Ra}$  and  $^{232}\text{Th}$  and the world average values, In addition to the data in Table 1, the values of  $^{40}\text{K}$  show a very huge margin compared to the values recorded for  $^{226}\text{Ra}$  and  $^{232}\text{Th}$ . Several literatures have shown that  $^{226}\text{Ra}$  and  $^{232}\text{Th}$  usually have lesser values than  $^{40}\text{K}$  (Hanfi *et al.*, 2019; Abedin and Khan, 2022; Madzunya *et al.*, 2020). Moreover, an elevated activity concentration of natural radionuclides recorded in rocks from the study may be attributed to the presence of minerals such as zircon, iron oxides, fluorite and other radioactive minerals that could contribute to the distribution of uranium and thorium in the earth's crust (Aita *et al.*, 2024; El Dabe *et al.*, 2022). In addition, the possible cause of high values from background radiation may be because of rocks being major hosts of naturally occurring radioactive materials (NORMs) (Oviri *et al.*, 2023).

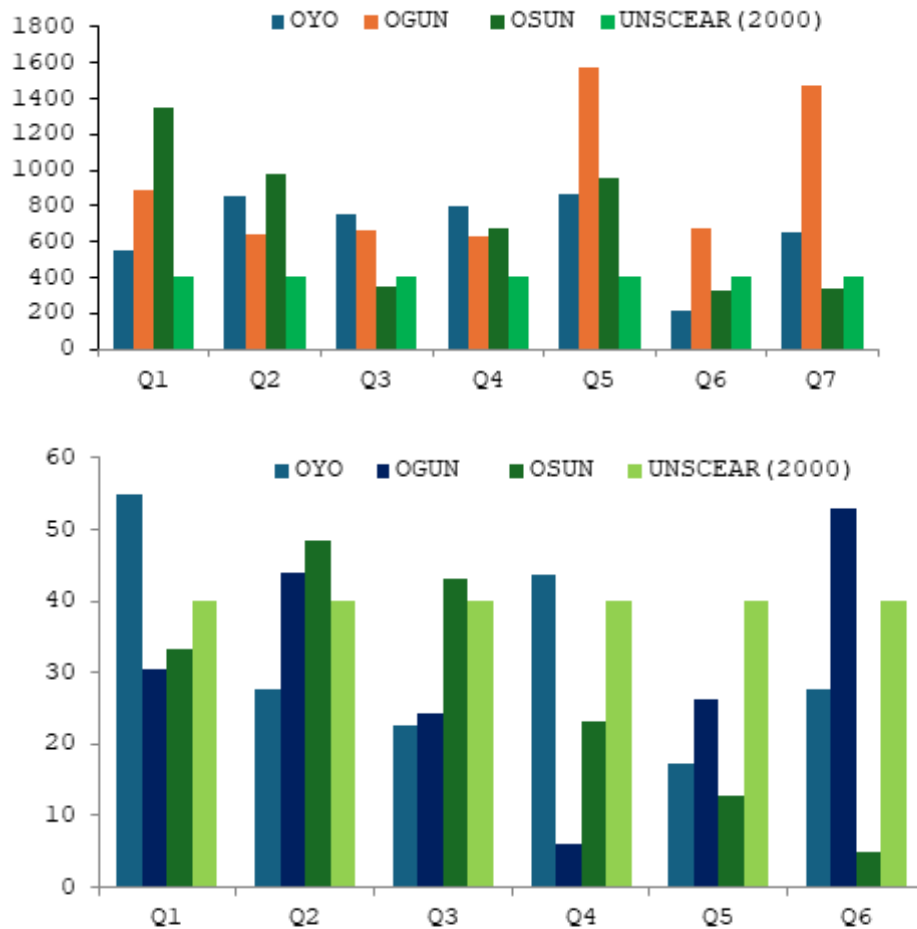


Figure 2: Concentration of  $^{226}\text{Ra}$  from Quarry sites

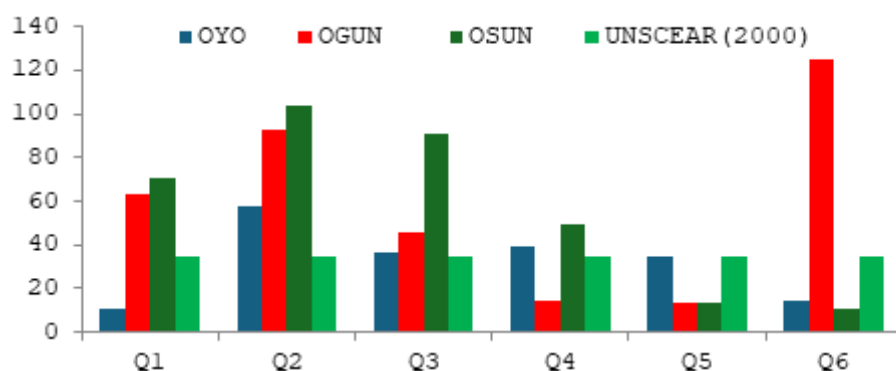


Figure 3: Concentration  $^{232}\text{Th}$  from Quarry sites

Table 1: Activity concentrations of  $^{40}\text{K}$ ,  $^{226}\text{Ra}$  and  $^{232}\text{Th}$ , in the samples from the study area

State	$^{40}\text{K}$ (Bqkg <sup>-1</sup> )		$^{226}\text{Ra}$ (Bqkg <sup>-1</sup> )		$^{232}\text{Th}$ (Bqkg <sup>-1</sup> )	
	Range	Mean	Range	Mean	Range	Mean
<b>OYO</b>						
Q1	446.4 - 660.6	553.6	53.8-56.7	55	109-115	11.1
Q2	1113.2 – 2289.1	859.1	BDL-30.1	27.8	BDL-60.4	57.5
Q3	1103 - 1189.9	756.4	BDL-29.4	22.7	BDL-46.2	36.6
Q4	790.5 - 820.2	797.1	BDL-50.5	43.6	BDL-47.2	39.3
Q5	1489.8 – 1686.2	864.7	16.0-20.4	17.2	31.7-38.0	34.6
Q6	2126.7 - 2140.4	213.3	BDL-28.4	27.7	BDL-15.4	14.1
Q6	1389.1 - 1501.8	650.4	3.9-5.0	4.9	8.9-11.9	10.4
<b>OGUN</b>						
Q7	677.8 - 1101.7	886.5	BDL-31.2	30.4	BDL-70.3	62.9
Q8	298.2 – 965.	643.9	17.9-79.3	44	37.7-167.2	92.8
Q9	630.3 - 679.3	658.8	19.8-31.6	24.4	43.4-48.3	45.6
Q10	620.6 - 650.3	634.3	4.2-8.2	6	8.9-21.1	14.1
Q11	1445.3 - 1681.2	1573.4	BDL-30.3	26.4	BDL-15.2	13.7
Q12	500.4 - 812.4	669.8	43.6-59.8	52.9	110.4-140.0	124.8
<b>OSUN</b>						
Q13	1302.2 - 1400.9	1351.4	28.9-36.2	33.2	65.4-77.4	71
Q14	890.8 - 1021.4	975.2	46.7-50.3	48.4	100.3-109.4	103.6
Q15	1159.5 - 1160.5	349.5	39.6-47.7	43.2	83.7-100.2	91
Q16	660.6 - 701.2	675.3	21.4-25.6	23.1	44.4-53.4	49.4
Q17	931.3 - 989.1	950.6	10.8-16.4	12.8	24.5-28.7	13.8

BDL- Below Detection Limit

### Outdoor absorbed and effective dose rates in rocks from the study area

Equation 2 was used to determine the absorbed dose rate ( $\text{nGyh}^{-1}$ ) due to radiation exposure in the air at 1 m above ground level and the results are presented in Table 2. The minimum absorbed dose rate was  $140.53\text{nGyh}^{-1}$  while the highest value was  $987.64\text{nGyh}^{-1}$  and the mean was  $459.59\text{nGyh}^{-1}$ . The mean absorbed dose rate in the present study was higher than the recommended world average limit of  $55\text{nGyh}^{-1}$  (UNSCEAR 2016). Moreover, the effective dose rate was calculated using equation 3 and presented in Table 2, the mean value of the effective dose rate was  $563\text{ mSvy}^{-1}$  and this value is  $0.103\text{mSvy}^{-1}$  greater than the world recommended value of  $0.460\text{mSvy}^{-1}$  from terrestrial radionuclide in a normal background area (UNSCEAR, 2016).

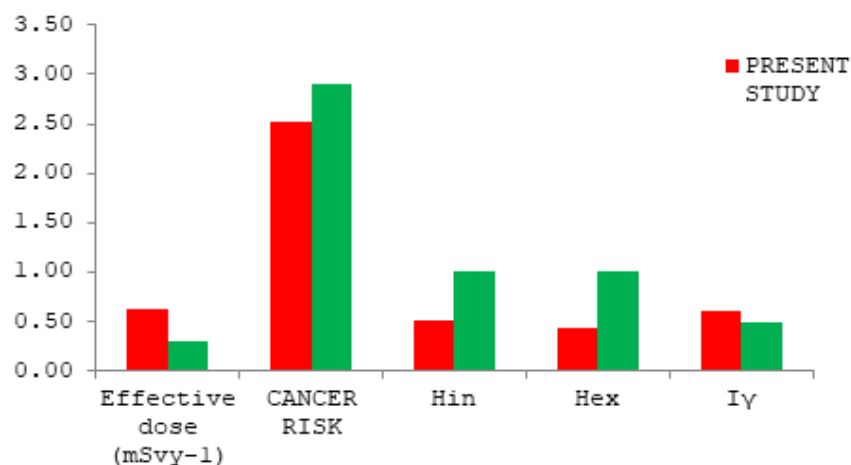
### Radiological hazard indices in rocks from the study area

The result of radium equivalent (Table 2). The maximum radium equivalent in the study was  $282.94\text{ Bqkg}^{-1}$  while the minimum value was  $64.29\text{ Bqkg}^{-1}$  and the mean value was  $144.69\text{ Bqkg}^{-1}$  which is about 39.1% of the world recommended average value of  $370\text{ Bqkg}^{-1}$  (UNSCEAR, 2016). According to Han *et al.*, (2023), the radium equivalent activity was  $33.25\text{ Bqkg}^{-1}$  from fine dust samples collected in Jeju, Korea, this result is lower than the value from this present work.

The results of the internal, external and gamma hazard indices are also presented in Table 2. The criterion demands that each of the three indices must be less than or equal to one ( $H_{in} \leq 1$ ;  $H_{ex} \leq 1$  and  $I_{\gamma} \leq 1$ ) for radiological safety precautions in the use of rocks or any material for the construction of dwellings. However, all the values obtained for the three indices are lower than one.

### Lifetime Cancer Risk Assessment (R)

The results of lifetime cancer risk obtained in the present study (table 2) varied when compared with the world recommendation value of  $8.4 \times 10^{-3}$  (UNSCEAR, 2016) corresponding to  $2.4\text{ mSvy}^{-1}$ . The highest in the present study was 4.88 which are two times lower than the safe limit value. The result indicated that there may be stochastic effects of radiation on human who are exposed to dust resulting from quarrying from the study areas. Figure shows the graph of excess life cancer risk alongside with other radiation hazard indices to evaluate our present results.



**Table 4: effective dose, cancer risk, internal hazard index, external hazard index and gamma index in the present study and world standard**

Table 2: Assessed radiological parameters of the samples from the study areas

Absorbed dose(nGy/hr)	Effective dose (mSvy <sup>-1</sup> )	CANCER RISK	H <sub>in</sub>	H <sub>ex</sub>	R <sub>aeq</sub> (Bqkg <sup>-1</sup> )	I <sub>γ</sub>
352.29	0.43	1.74	0.46	0.31	113.50	0.42
562.88	0.69	2.78	0.55	0.48	176.18	0.67
489.05	0.60	2.42	0.42	0.36	133.28	0.51
516.52	0.63	2.55	0.55	0.44	161.18	0.61
555.37	0.68	2.74	0.41	0.36	133.26	0.52
140.53	0.17	0.69	0.25	0.17	64.29	0.23
410.20	0.50	2.03	0.20	0.19	69.85	0.29
582.54	0.71	2.88	0.59	0.51	188.61	0.71
445.75	0.55	2.20	0.73	0.61	226.28	0.83
432.46	0.53	2.14	0.44	0.38	140.34	0.53
401.92	0.49	1.99	0.22	0.20	75.00	0.30
987.64	1.21	4.88	0.52	0.45	167.14	0.68
477.01	0.59	2.36	0.91	0.76	282.94	1.02
875.78	1.07	4.33	0.73	0.64	238.76	0.92
657.31	0.81	3.25	0.86	0.73	271.64	1.00
261.48	0.32	1.29	0.66	0.54	200.24	0.72
444.44	0.55	2.20	0.46	0.39	145.74	0.55
598.74	0.73	2.96	0.32	0.29	105.68	0.43

**H<sub>in</sub>**= Internal hazard index, **H<sub>ex</sub>** = external hazard index, **R<sub>aeq</sub>** = radium equivalent, **I<sub>γ</sub>** = gammadose

## Conclusion

The activity concentration in rock was determined and from the result, the value obtained for <sup>40</sup>K, <sup>226</sup>Ra and <sup>232</sup>Th are comparably higher than the world recommended except for <sup>226</sup>Ra. The mean value of absorbed dose and effective dose are slightly higher than the world average values. In addition, all three indices that are used to determine radiological safe material for building construction are within the criteria limit ( $\leq 1$ ). The results from this present study showed that radiation hazard associated with dust has serious health impacts on humans, also, there is a radiological protection concerns for the workers in the quarry who are exposed directly to the dust and spend long working hours within the vicinity, a long terms effects may be suspected. Furthermore, long-term radiation exposure is detrimental to human health, necessitating the need to discourage sitting of residential settlements near quarrying sites to minimize the long-term effects of ionizing radiation. To actualize the Sustainable Development Goal (SDG), appropriate monitoring of environmental pollution particularly from dust must be ensured.

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## 2. Economic and Environmental Benefits Wastepaper Recycling in Lagos State, Nigeria

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### Abstract

The study assessed the economic and environmental benefits of paper waste recycling in Lagos State, Nigeria. Data was gathered by administering 100 copies of structured questionnaires to companies and individuals involved in wastepaper collection for sales. Principal components analysis (PCA), simple percentages, and averages were used to analyze the data. PCA results identified an increase in job opportunities (21.57%), an increase in economic development opportunities (21.15%), and sustaining local manufacturing firms (19.4%) as significant dimensions of the economic benefits of wastepaper recycling. It also revealed that most of the respondents stated that wastepaper recycling reduces pollution (97%), saves energy needed to manufacture new paper (95%), and protects the environment from destruction (75%). Based on the findings, the study recommended a public-private partnership in wastepaper recycling.

**Keywords:** Wastepaper recycling, environmental benefits, Perceived economic benefits, Lagos State

### Introduction

Paper undeniably exists in human civilizations because it enhances saving information and passes it to the next generations. Globally, paper is used in everyday life for immeasurable purposes, so its consumption has increased. The demand for paper has increased with the increase in human population and the need to save and pass on information. This has increased the demand for raw materials (Ferrara and De Feo, 2021; Yilmaz and Gumuskaya, 2015). To solve the problem of sourcing raw materials for paper production, technologies over the years have been developed for sustainable recycling rather than sustainable forestry. Through this process, all waste-paper components are separated except for fibers using the most economical and environmentally friendly methods and recycling is crucially important (Yilmaz and Gumuskaya, 2015; Karademir et al., 2012). Cellulose is the base material of paper production. Plant sources such as trees and other kinds of perennial and annual plants are consumed if the cellulose is obtained solely from raw fibers.

For centuries, forests as well as other ecosystems where such plant sources are found have been exploited as sources for raw fibers to produce paper. Such exploitation puts the sustainability of natural resources in danger (Sultan and Gulnur, 2017). To sustainably manage plant resources for future generations and meet the increasing

demands for papers, recycling waste papers has been the focal source of raw materials for paper production. As the demand for paper has increased, paper producers are now forced to use wastepaper as raw material. Because there is a decrease in the number of natural resources such as wood, hay, and cotton (which are used as raw materials to produce cellulose, and cellulose is the raw material of paper), reforestation takes a long time and environmental pollution and cost of energy have increased (Yakut, 2012). The recycling of wastepaper has countless economic and environmental benefits. In line with this, Van Beukering and Duraiappah (1998) stated that recycling may generally be considered a key strategy for alleviating the pressures of society on the environment. They opined that recycling reduces the demand for energy and finite resources, results in less water pollution and air emissions, and mitigates the problem of solid waste disposal.

Recycling paper reduces the pressure on natural resources such as forests. Moreover, recycling may be considered economically beneficial in developing countries. First, it provides significant employment opportunities to a large informal sector. The high degree of the labour intensity of certain reclamation processes enables numerous people to amass some income. Second, recycling can reduce the costs for raw materials in the production process and thereby may increase the supply of cheaper products. Third, it can reduce dependence on foreign resources and thereby save on expenditure on imports in developing countries. In the literature, several studies have been carried out on the economic benefits of wastepaper recycling (Chukwuemeka, 2019; Sultan and Gulnur, 2017; Ferrara C., and De Feo, G., 2014); others looked at the environmental benefits of wastepaper recycling (Čabalová et al., 2011), while the several others examined the economic and environmental benefits (Van Beukering and Duraiappah, 1998). A good number of these studies largely looked at the recycling of waste papers from a descriptive perspective as they did not make use of empirical data. Also, most studies did not show the main economic and environmental benefit (s) of wastepaper recycling. Identifying specific benefits of substantial levels will enable interventions to be channeled towards expanding the observed benefits of wastepaper recycling. It is on this noticeable research gap that the present study is carried out. The study examines the perceived economic and environmental benefits of wastepaper recycling in Lagos State.

### **A brief review of the literature**

UNEP (2021) stated that expanding wastepaper recycling in Kenya would result in additional jobs in collecting, separating, and processing recycled paper. The recycled paper would substitute imported paper and conserve foreign exchange earnings. The report also stated that paper recycling plants are major investments that require large capital outlays. However, as the demand for paper in the country remains unsatisfied, the investment will be recovered in the long term. In addition, Paper Recycling Coalition (2021) stated that the recycled paper industry is a major contributor to the U.S. economy and that during the 1990s alone, U.S. papermakers invested an estimated \$10 billion in new recycling capacity. That recycled paper, paperboard, and deinked market pulp mills employ nearly 140,000 people directly and influence another 615,000 jobs, for a total of nearly 755,000 jobs nationwide. The annual payroll of recycled paper, paperboard, and deinked market pulp mills is \$6.9 billion. The report further stated that through taxes and other receipts; recycled paper, paperboard, and deinked market pulp mills contribute \$9.6 billion to federal, state, and local government revenues.

Similarly, the Environmental and Energy Study Institute (2014) stated that recycling is an easy way for individuals to protect the Earth and help the economy. The report revealed that America's recycling industry accounted for more than one million jobs and over \$236 billion in annual revenue in 2001 when the last extensive study was carried out. In 2010, the U.S. recycling industry sold 44 million metric tons of recycled materials valued at almost \$30 billion to over 154 countries around the world. In addition to generating income, recycling saves money by reducing spending on landfills (which charge tipping fees and require significant amounts of land). Recycling also produces substantial energy savings of up to 87 per cent for mixed plastics and 92 percent for aluminum cans. Recycling has important environmental benefits: it limits the need to extract new resources and reduces greenhouse gas emissions. In 2012 alone, recycling prevented the equivalent of 168 million metric tons of carbon dioxide emissions, which is comparable to taking 33 million passenger vehicles off the road.

The Montana Department of Environmental Quality (2004) stated that throughout the United States, recycling has resulted in economic growth, income growth, net job increases, long-term investment, energy savings, waste reduction, lower production costs for many industries, and an extension of the life of landfills. While referring to the California Environmental Protection Agency, the report revealed that waste diversion of any type, including recycling, tends to create twice the economic activity per ton of conventional waste disposal. The United States Environmental Protection Agency (2020) reported that recycling has economic and community benefits which include increasing economic security by tapping a domestic source of materials, supporting American manufacturing, and creating jobs in the recycling and manufacturing industries. The report showed that recycling and reuse of materials creates jobs, while also generating local and state tax revenues. In 2012, the report stated that recycling and reuse activities in the United States accounted for 681,000 jobs, \$37.8 billion in wages; and \$5.5 billion in tax revenues which equates to 1.17 jobs for every 1,000 tons of materials recycled.

The United States Environmental Protection Agency (2020) stated that also recycling conserves resources and protects the environment. Environmental benefits include reducing the amount of waste sent to landfills and combustion facilities; conserving natural resources, such as timber, water, and minerals; and preventing pollution by reducing the need to collect new raw materials. More so, Michigan Recycling Coalition (2001) cited in Miller et al., (2008) reported that recyclable materials processing has a significant impact on Michigan's economy. Respondents to a survey of recyclable materials processors conducted by the Michigan Recycling Coalition reported \$437 million in annual revenue, 1,920 jobs, and over \$52 million in annual payroll attributable directly to processing activities. When extrapolated from the 51 percent of entities who responded to the survey to the entire processing industry in Michigan, this implies total annual revenues of over \$1.9 billion, total employment of 5,028, and a total annual payroll of more than \$137 million.

The United States Environmental Protection Agency (2016) stated that paper recycling reduces greenhouse gas emissions that can contribute to climate change by avoiding methane emissions and reducing the energy required for some paper products; extends the fiber supply and contributes to carbon sequestration; saves considerable landfill space; reduces energy and water consumption and decreases the need for disposal (i.e.,

landfill or incineration which decreases the amount of CO<sub>2</sub> produced). The report further stated that recycling one ton of paper would save enough energy to power the average American home for six months; save 7,000 gallons of water; save 3.3 cubic yards of landfill space and reduce greenhouse gas emissions by one metric ton of carbon equivalent (MTCE). Similarly, the Green America Report (2021) stated that recycled paper use saves resources and reduces the paper industry's impact on the planet. Using 100% recycled copy paper instead of 100% virgin fiber paper saves 100% of the trees; saves 31% of the energy; saves 53% of the water and produces 39% less solid waste. It also reported that recycled paper production emits 40% fewer greenhouse gases and uses 26% less energy.

University of Southern Indiana (2021) reported that to produce each week's Sunday newspapers, 500,000 trees must be cut down and that recycling a single run of the Sunday New York Times would save 75,000 trees. If all newspapers were recycled, about 250,000,000 trees would be saved each year. The report showed that the average American uses seven trees a year in paper, wood, and other products made from trees. This amounts to about 2,000,000,000 trees per year and the amount of wood and paper thrown away each year is enough to heat 50,000,000 homes for 20 years. The report also stated that each ton (2000 pounds) of recycled paper can save 17 trees, 380 gallons of oil, three cubic yards of landfill space, 4000 kilowatts of energy, and 7000 gallons of water. This represents 64% energy savings, 58.0% water savings, and 60 pounds less of air pollution. The 17 trees saved can absorb a total of 250 pounds of carbon dioxide from the air each year. Blue (2024) stated that paper makes up about 28 percent of solid trash in landfills and one ton of paper takes up about 3.3 cubic yards of landfill space. Therefore, recycling paper and cardboard saves space in landfills for trash that cannot be recycled, and saving space in landfills reduces the need to build more landfills.

Yilmaz and Gumuskaya (2015) stated that one tree is saved every time 54 kg of newspaper is recycled and that each ton of recycled paper saves 17 trees. The study further showed that photocopy papers, kitchen rolls and tissues, corrugated cardboard, and newspapers can be made from recycled paper. Also, every saved tree produces the amount of oxygen that 3 people consume as well and recycled paper consumes 64% less energy compared to producing paper from cellulose. The study further revealed that when producing 1 ton of recycled paper, 2.5 tons of petroleum and 26 tons of water are saved. Also, UNEP (2021) stated that recycled paper reduces the amount of waste that would go to landfills thus prolonging the life of landfill sites. And that recycling of wastepaper avoids the production of methane gas that would have resulted from the anaerobic decomposition of wastepaper therefore contributing to climate change mitigation. In addition, wastepaper recycling significantly reduces energy use as the recovered pulp uses more energy than virgin pulp therefore conserving energy.

Paper Recycling Coalition (2021) stated that rigorous scientific research has demonstrated that manufacturing paper with recycled content is good for the environment and that producing recycled paper requires less energy than making paper from trees. By recycling paper, we prevent it from being landfilled where it degrades, producing methane, and a greenhouse gas. According to the U.S. EPA, landfills are the largest U.S. source of methane emissions to the atmosphere, and degrading paper 24 times as potent as carbon dioxide is a primary

cause. The report also revealed that manufacturing with recovered paperboard reduces air pollutants such as nitrogen oxides that contribute to smog and particulate emissions that cause respiratory problems. Producing recycled paperboard and containerboard also requires less water and energy. In line with this, the Montana Department of Environmental Quality (2004) stated that recycling also reduces pollution and conserves natural resources, which leads to cleaner air and water, and it increases open space and reduces greenhouse gases.

## **Materials and methods**

### **Study area**

#### **Data collection procedure and analysis**

Random and accidental sampling techniques were employed. The random sampling technique was used to select three (3) wastepaper recycling companies in Lagos State. The accidental sampling technique was employed to administer 100 copies of the structured questionnaire to the staff of the selected companies as well as individuals involved in the wastepaper collection for sales. This technique was deemed suitable because of the difficulties in accessing the staff of the recycling companies as well as wastepaper scavengers. As such, respondents were approached in landfill areas and other areas. The questionnaire was administered by the researcher. The questionnaire was divided into three sections. Section A had questions that measured the socioeconomic characteristics of respondents; Section B measured the economic benefits of wastepaper recycling; Section C measured the environmental benefits of paper battery recycling. The items in Sections B and C were measured using 4-point ordinal scales with responses ranging from Totally agree, Agree, Disagree and Totally disagree.

#### **Data analysis**

Data obtained were analyzed using simple percentages, averages (mean), and principal components analysis (PCA). The statistical analyses were performed with the aid of SPSS (Statistical Package for Social Sciences) Version 21.0 and Microsoft Excel Spreadsheet.

## **Results**

### **Socioeconomic and demographic characteristics of respondents**

The socioeconomic and demographic characteristics of respondents substantially influence respondents' perception of wastepaper recycling and their involvement in wastepaper scavenging or collection. The sex of respondents showed that there were more males than women implying that males dominated the survey (Table 1). This is because 82% of the respondents surveyed were males, while 18% were females. The dominance of males is anticipated as males are heads of families and tend to be more involved in scavenging jobs than their female counterparts. Information on the age of respondents showed that respondents between the ages of 25 to 30 years dominated the survey (51%), followed by those between the ages of 31 to 36 years (Fig 1). The observed pattern therefore shows that most of the respondents (87%) fall between the ages of 25 to 36 years. It therefore means that the recycling business is largely dominated by young adults.

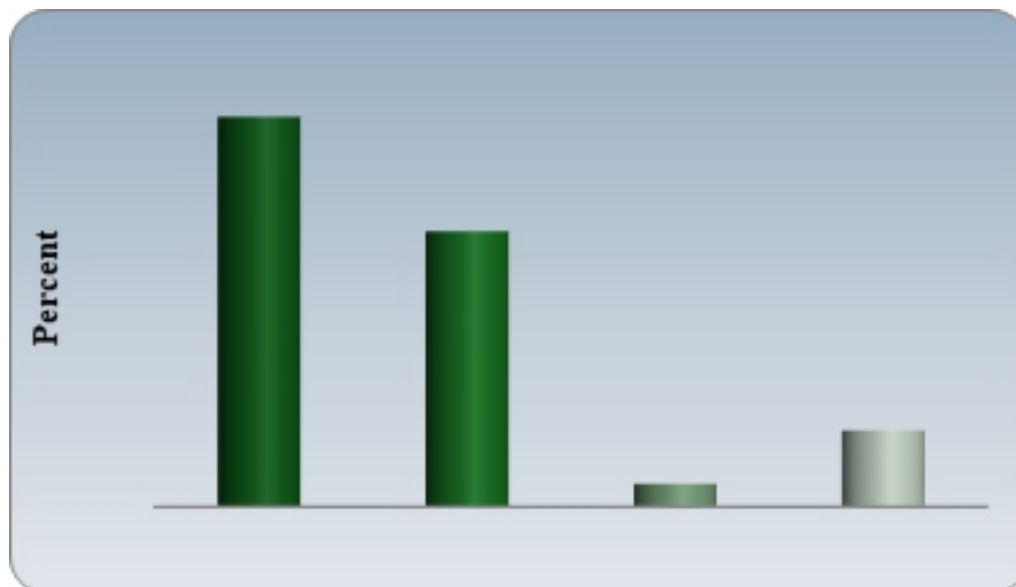


Figure 1: Ages of respondents

The educational status showed that the respondents had varied qualifications ranging from primary education to tertiary education (Table 1). It showed that a significant proportion (74%) of the respondents had secondary education, followed closely by primary education and tertiary education with 19% and 7% respectively. From the results obtained, it is apparent that a good number of respondents precisely 93% have primary and secondary education. The result nevertheless suggests a high literacy level which can influence the people's level of understanding and knowledge of land use land cover in the area. In a similar study, Munthali et al., (2019) reported that 77.8% of the respondents were literate. The educational qualifications of respondents could also influence the way households in the area manage land use land cover changes that are inevitable.

**Table 1: Socioeconomic and demographic profile of respondents**

Variables	Categories	Freq	Percent
Sex	Male	82	82.0
	Female	18	18.0
Age	25 – 30yrs	51	51.0
	31 – 36yrs	36	36.0
	36 – 41yrs	3	3.0
	36 – 41yrs	10	10.0
Education	Primary	19	19.0
	Secondary	74	74.0
	Tertiary	7	7.0

### Perceived economic benefits

Perception of respondents on the perceived economic benefits of wastepaper recycling was determined using principal components analysis (PCA). The statistical tool was employed due to the number of variables used to measure the perceived economic benefits of wastepaper recycling. PCA result of 8 variables resulted in the extraction of three (3) components that accounted for 62.1% of the variation in the data set (Table 2).

Employing component loadings  $\pm \geq 0.8$ , PC<sub>1</sub> (principal component one) had strong and positive loadings on *recycling wastepaper creating job opportunities* (0.884). The positive loading simply means an increase in job opportunities with the increase in wastepaper recycling. PC<sub>1</sub> was responsible for 21.57% of the total variance in the data set and represented an increase in job opportunities. On PC<sub>2</sub>, only one variable loaded on it; the variable was *wastepaper recycling promotes economic development opportunities* (0.899). PC<sub>2</sub> was responsible for 21.2% of the total variance in the data set and represented an increase in economic development opportunities. Likewise, PC<sub>3</sub> had one variable that positively loaded on it; the variable was *recycling helps in maintaining local manufacturing firms* (0.821). PC<sub>3</sub> was responsible for 19.4% of the total variance in the variable set and represented sustaining local manufacturing firms.

The result in Table 2 identifies an increase in job opportunities, increase in economic development opportunities, and sustaining local manufacturing firms as the significant dimensions of perceived economic benefits of wastepaper recycling. These three dimensions or factors largely explain the inherent perceived economic benefits of wastepaper recycling. The first extracted component, which has a large explanation clearly shows that recycling creates job opportunities. Through recycling, many recycling plants will be set up leading to a long chain of collection and delivery. All these activities are performed by humans, which will also trigger an explosion of opportunities. Recycling is an integrated process that begins with recyclable material collection from locations such as households, drop-off points, construction, and demolition centers, and businesses. After collecting, these recyclable materials go through a thorough sorting process to separate various materials as well as different quality goods. All these processes create jobs for different groups of people. From the collection of materials to sales, recycling businesses need varying degrees of skilled and semi-skilled employees. This agrees with the findings of UNEP (2021) that the expansion of wastepaper recycling in Kenya would result in the creation of additional jobs in the collection, separation, and processing of recycled paper. The recycled paper would substitute imported paper and conserve foreign exchange earnings. The report also stated that paper recycling plants are major investments that require large capital outlays. However, as the demand for paper in the country remains unsatisfied, the investment will be recovered in the long term. In addition, Paper Recycling Coalition (2021) stated that the recycled paper industry is a major contributor to the U.S. economy and that during the 1990s alone, U.S. papermakers invested an estimated \$10 billion in new recycling capacity. That recycled paper, paperboard, and deinked market pulp mills employ nearly 140,000 people directly and influence another 615,000 jobs, for a total of nearly 755,000 jobs nationwide.

The second extracted component shows that wastepaper recycling promotes economic development opportunities. The recycling of waste papers creates an avenue for local businesses to flourish. The availability of raw materials will attract local and foreign industries which will foster economic growth. In this way, large quantities of paper will be locally produced and sold to other countries. The growth of recycling is being driven by increasing demand for recyclables which helps make the economy thrive by pushing up the price of materials. It also boosts the economy by increasing the number of recyclables sorted and placed on the market. Recycling promotes economic development opportunities by creating more jobs at higher income levels and by being able to meet a large proportion of the economy's resource demand, alleviating pressure on ecosystems to provide



resources and assimilate waste cans. This agrees with the submission of Miller et al., (2008) that recyclable materials processing has a significant impact on Michigan's economy. Respondents to a survey of recyclable materials processors conducted by the Michigan Recycling Coalition reported \$437 million in annual revenue, 1,920 jobs, and over \$52 million in annual payroll attributable directly to processing activities. When extrapolated from the 51 percent of entities who responded to the survey to the entire processing industry in Michigan, this implies total annual revenues of over \$1.9 billion, total employment of 5,028, and a total annual payroll of more than \$137 million.

The third extracted component reveals that recycling helps in maintaining local manufacturing firms. Recycling paper waste can help sustain local firms because the process helps save money and improve the firm's bottom-line production. Recycling can create cost avoidance and free up funding for other sustainable initiatives. This process enables local industries to thrive and optimally utilize resources within their reach without much economic cost. Through recycling activities, local firms can remain in production and be high in the competitive market. Since raw materials are readily available, the local firms make good use of available resources for their growth. This is because paper is easy to convert into a new one and resold in large quantities. Paper recycling makes it possible for local manufacturing firms to remain in business and their ability to remain in business enables them to attract new customers, enhance their chances of winning contracts, and improve customer loyalty. The result in Table 2 therefore identifies an increase in job opportunities, an increase in economic development opportunities, and sustaining local manufacturing firms are the principal perceived economic benefits of wastepaper recycling.

**Table 2: PCA result of economic benefits of wastepaper recycling**

Variables	Components		
	PC <sub>1</sub>	PC <sub>2</sub>	PC <sub>3</sub>
Recycling of wastepaper creates job opportunities	<u>.884</u>	-.028	-.052
Recycling helps satisfy the increasing demand for paper products and raw materials	.718	-.040	.283
Wastepaper recycling saves industries the costs of sourcing material and energy production	.604	.160	-.029
Wastepaper recycling promotes economic development opportunities	-.146	<u>.899</u>	.121
Wastepaper recycling reduces importation	.112	.764	-.346
Wastepaper recycling generates revenue for the government via taxes	.381	.663	.309
Recycling helps in maintaining local manufacturing firms	-.084	-.011	<u>.821</u>
Recycling helps in the provision of household income	.206	.052	.751
<b>Eigenvalues</b>	<b>1.73</b>	<b>1.69</b>	<b>1.55</b>
<b>% variance</b>	<b>21.57</b>	<b>21.15</b>	<b>19.4</b>
<b>Cumulative exp.</b>	<b>21.57</b>	<b>42.72</b>	<b>62.11</b>

<sup>a</sup>the underlined with coefficients  $\pm \geq 0.8$  are considered significant

## Environmental benefits

The environmental benefits of wastepaper recycling are presented in Table 3. As shown in Table 4.9, only the first three items with high mean values and responses were used to establish the perceived environment of wastepaper recycling. The first ranked item revealed that the majority (97%) of the respondents stated that wastepaper recycling reduces air, water, and soil pollution. This is expected as recycling substantially reduces the need to grow and extract new raw materials from the earth's crust. This in turn lessens the harmful disruption and damage that would have done to the natural world. The extraction of latex would have resulted in the falling of trees or clearing of forests, rivers would be diverted, wild animals would have been harmed or displaced, and there would have been pollution of water, soil, and air. Recycling wastepaper helps to keep the environment clean without which used papers would be blown down or washed into rivers and seas and end up hundreds or thousands of miles away, polluting coastlines and waterways and becoming a problem to the environment. Indeed, wastepaper recycling goes a long way towards considerably cutting back on the levels of pollution because these waste products are reused rather than being thrown away recklessly. In a related study, the United States Environmental Protection Agency (2016) stated that paper recycling reduces greenhouse gas emissions that can contribute to climate change by avoiding methane emissions and reducing the energy required for several paper products; extends the fiber supply, and contributes to carbon sequestration; saves considerable landfill space; reduces energy and water consumption and decreases the need for disposal.

The second-ranked item revealed that 95% of the respondents stated that wastepaper recycling saves energy (saves the amount of energy needed to manufacture new cans or products). This is expected as the amount of energy needed to extract ore is preserved, and this saves the industry a huge amount of money. The recycling of paper can save precious natural resources, energy, time, and money which will benefit the earth, the economy, and local communities. Making products from recycled materials requires less energy than making them from new raw materials. Sometimes there is a huge difference in energy. Belinda (2006) asserted that manufacturing with recycled materials saves energy and water and produces less air and water pollution than manufacturing with raw materials. Recycling reduces mining and drilling, which produces air and water pollution. By saving energy, recycling reduces the air pollution caused by burning fossil fuels such as coal, natural gas, and oil which contributes to the largest amount of energy generated. The Green America Report (2021) stated that recycled paper use saves resources and reduces the paper industry's impact on the planet. Using 100% recycled copy paper instead of 100% virgin fiber paper saves 100% of the trees; saves 31% of the energy; saves 53% of the water and produces 39% less solid waste. It also reported that recycled paper production emits 40% fewer greenhouse gases and uses 26% less energy.

The third-ranked item revealed that 75% of the respondents stated that recycling protects the environment from damage (Table 3). This perhaps is vital as recycling plays a big part in protecting the earth in the most balanced way. While many trees are felled every day, recycled waste cans reduce deforestation. The recycling process involves minimal combustion, and waste is transformed into reusable materials with zero or minimal harmful impact on the environment. The whole process of processing and manufacturing products from wastepaper emits few greenhouse gases because the waste recycling industries burn little fossil fuels. If the process of

recycling used and old materials is not there, it means new products will be manufactured by the extraction of fresh raw materials. For this reason, recycling conserves existing raw materials and protects them for future use which ensures sustainable and optimal use. In a related study, UNEP (2021) stated that recycled paper reduces the amount of waste that would go to landfills thus prolonging the life of landfill sites. And that recycling of wastepaper avoids the production of methane gas that would have resulted from the anaerobic decomposition of wastepaper thus contributing to climate change mitigation. In addition, wastepaper recycling significantly reduces energy use as the recovered pulp uses more energy than virgin pulp thus conserving energy. The result in Table 3 shows that many respondents stated that recycling wastepaper reduces air, water, and soil pollution; saves the energy needed to manufacture new paper, and protects the environment from damage.

**Table 3: Environmental benefits of wastepaper recycling**

Variables	Total % response		Mean	Rank
	TA	TD		
Reduce air, water, and soil pollution	97.0	3.0	3.61	1
Saves energy needed to manufacture new paper	95.0	5.0	3.34	2
Protect the environment from damage	75.0	15.0	3.29	3

TA = totally agree and TD = totally disagree

### Conclusion

The study has shown that wastepaper recycling impacts positively on the environment. The outcome of the study shows that wastepaper recycling has several benefits to the environment and human well-being. The study clearly shows that an increase in job opportunities, an increase in economic development opportunities, and sustaining local manufacturing firms are significant dimensions or perceived economic benefits of wastepaper recycling. It further reveals that reduction of air, water, and soil pollution; energy saving or conservation, and protection of the environment from damage are the perceived environmental benefits of wastepaper recycling. The study shows that wastepaper recycling does not significantly impact the environment.

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### 3. Cost, environmental impact and the resilience of renewable energy under a changing climate in Africa

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#### Abstract

*The heavy reliance on fossil fuels in Africa to attain and sustain economic prosperity and the attendant negative environmental consequences have now been ubiquitously recognized as an undeniable threat to achieving SDG Goal 13 – Climate Action: taking urgent actions to tackle climate change and its variegated impacts on our planet. Presently, Africa is the most vulnerable region to the impacts of climate change. Severe climate-induced environmental and economic challenges have triggered endemic poverty which has blurred the horizon of the continent's development trajectories. This paper aims to examine the cost, environmental impact and resilience of renewable energy under a changing climate in Africa. The descriptive quantitative method of data analysis was employed using secondary data summarized and presented in charts and tables. Findings show that renewable energy sources are abundantly available, but poorly and inadequately exploited in Africa. The evidence further confirmed that while Africa has the most abundant renewable energy resources, its renewable energy utilization is the least developed. It is further established that renewable energy technology costs in Africa have decreased significantly since 2010 with the cost of solar and wind-generated electricity per kilowatt-hour in 2021 being lower than those of fossil fuels. While it is estimated that almost all renewable energy sources have exclusively positive environmental effects, the negative effects associated with some can be mitigated through careful choice and utilization. We recommend that investment in renewable energy in Africa should be accelerated and funded to address the current climate and environmental challenges facing Africa, African national governments should address the key issue of cost in the energy transition process and policy reforms by internalizing the environmental and economic costs of different energy types in the transition agenda.*

**Keywords:** Renewable Energy, Climate Change, Levelised Cost of Energy, Energy Transition, Environmental Impact.

#### Introduction

In recent years, and while striving to attain Goal 8 of the UN-SDG which seeks to promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all, almost every nation resorted to the use of high-intensity fossil fuels as the primary source of energy for economic growth and prosperity. Barney and Franzi (2002) argue that energy is responsible for at least half the industrial growth in a

modern economy while representing less than one-tenth of the cost of production. However, the process of converting and using fossil fuels involves a combustion process that produces environmentally harmful greenhouse gases (GHGs) producing global warming and exacerbating the impact of climate change. For this reason, fossil fuels constitute a potent threat to Goal 13 - Climate Action: taking urgent actions to tackle climate change and its variegated impacts on our planet.

With most countries in Africa resource-rich and highly dependent on fossil energy and lacking access to clean energies due to poor technological development and slow penetration of energy conversion technologies, there is a high tendency for the same policy of reliance on fossil fuels to continue with the dire consequence of increasing greenhouse gas emissions. Carbonization arising from the intense usage of fossil fuels for transportation, industry, building, and agriculture accentuates the risk of global warming as the Earth is already about 1.1°C warmer than it was in the late 1800s, and emissions continue to rise (UN, 2023). Hence, there is now an increasing need to mitigate climate change to make the Earth a livable planet.

Unarguably, Africa is the most vulnerable region to climate change and, by far, the worst hit by the variegated negative impact of environmental challenges confronting the world. The high and growing pace of environmental degradation in Africa is attributed to anthropogenic activities (IPCC, 2014; Stern, 2006). Anthropogenic activities refer to the human activities causing pollution (World Bank, 2018; IPCC, 2014). According to the Global Citizen Report (2023), climate change is impacting Africa the hardest in the following ways: (a) Almost a quarter of a billion Africans will face water scarcity by 2025, (b) 5 of the 10 countries most impacted by climate change are in Africa, according to the 2021 Global Climate Risk Index (c) Tropical storms in Southern Africa displaced half a million people in just three months this year, (d) 46 million people do not have access to enough food in the Horn of Africa and Sahel Region, (e) Hundreds of billions of locusts swarmed East Africa in 2020, (f) 86 million Africans could be forced to leave their homes in 2050, and (g) 1 in 3 deaths from extreme weather happen in Africa.

Furthermore, Africa's vulnerability to climate change has been linked to endemic poverty which clogged the wheel of the continent's development trajectories. According to Bailey (2009), people's climate and environmental vulnerability are inextricably linked with poverty, as poor people tend to live in poorly constructed homes, often in communities exposed to environmental hazards such as floods, landslides, or droughts, and in areas lacking basic health services or infrastructure. Poor people also tend to have fewer assets to use and/or sell to cope in the aftermath of an environmental or natural disaster, and they also generally lack access to social safety nets. It is therefore not a sheer coincidence that the African countries with high climate risk index are also ranked low in the human development index (for example, Mozambique and Zimbabwe with the two highest climate risk indexes in Africa are also ranked 181st and 150th respectively on global HDI ranking), thereby highlighting the nexus between vulnerability to climate change and the quality of human life as measured by HDI.

Consequently, this study becomes imperative against the backdrop of the need for Africa to achieve substantial and more sustainable progress in the journey to the attainment of Sustainable Development Goals (SDGs) after so many years of trailing the blaze. One veritable way to address the global climate crisis is through transitioning to renewable energy use. However, evidence shows no African country ranks among the world's top 30 in energy transition (AfDB,2023). Thus, one of the fundamental fields of action for energy transition in Africa is de-



risking and promoting private sector investment because the investments required to meet Africa's growing demand for renewable energy are far greater than the funds available from public sources (IRENA, 2021). Therefore, when private investment in the renewable energy sector in Africa is considered, there is a crucial need for the assessment of the cost and benefits of renewable energy sources, the environmental impacts of renewable energy and the need to consider its resiliency in terms of its ability to survive and quickly recover from extreme and unexpected disruptions. A high [energy system](#) resilience is of utmost importance to modern societies that are highly dependent on continued access to energy services (Jasilunas *et al.*, 2021).

Following the introduction, this paper is structured as follows: Section 2 focuses on the conceptual review and review of literature related to the study by highlighting the different types of renewable energy sources and the need for transitioning to renewable energy, while Section 3 dwells on the theoretical framework and methodology adopted for the study. We consider the cost of the various types of renewable energy in Section 4 by examining the cost of solar, hydropower and biomass renewable energy sources. Section 5 centres on the impact of the different renewable energy sources on the environment by assessing the positive and negative environmental impact, while Section 6 assesses the state of climate resilience and readiness in Africa by considering some key parameters. Section 7 closes the paper with a conclusion and recommendation.

## Conceptual Framework and Review of Literature

### Types of Renewable Energies

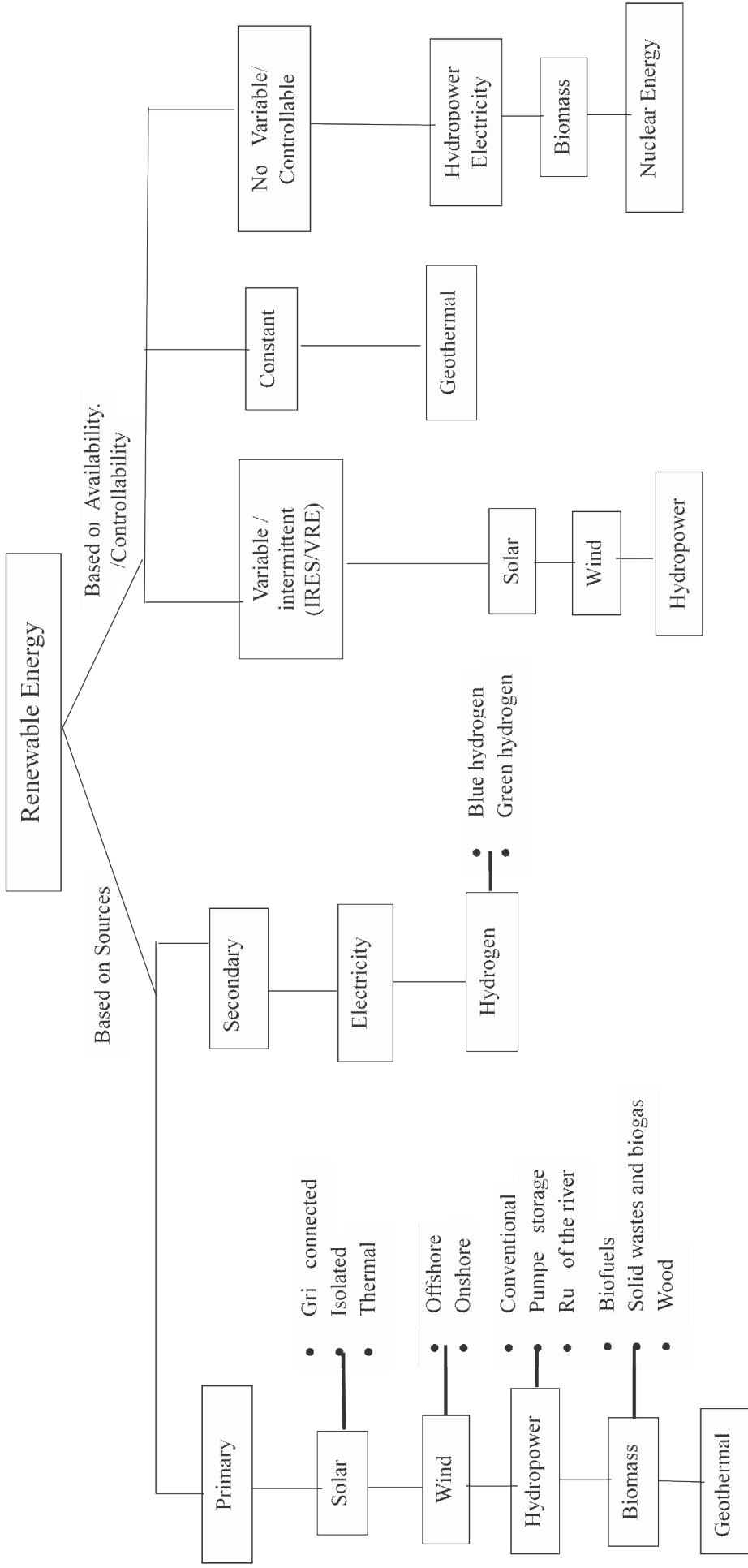
Renewable energy is energy that is derived from natural resources. To achieve carbon neutrality, the global share of renewable energy is projected to increase from 14% in 2018 to approximately 74% in 2050, requiring an eightfold annual increase (Osman *et al.*, 2022). Renewable energy is obtained from sources that are essentially inexhaustible and the most important feature of this source of energy is that they can be harnessed and utilized without the release of harmful pollutants such as greenhouse gases (GHGs) that are potential sources of global warming and climate change. It is well established that the activities of developed nations are mostly accountable for climate change, but the developing nations are those suffering more due to the inability to cope as a result of poverty and low technological development (Odjugo, 2010).

According to categorization obtained from the review of relevant literature, renewable energy technologies, as depicted in Fig. 1, are classified primarily into (i) solar energy, also known as photovoltaic energy, (ii) wind energy, (iii) geothermal energy, (iv) biomass energy, and (v) hydropower energy. (Bortoluzzi *et al.*, 2021; Farrell *et al.*, 2019). Solar energy is also known as photovoltaic (PV) energy, and it is solely generated from sunlight (Bortoluzzi *et al.*, 2021; Farrell *et al.*, 2019). Solar energy includes solar photovoltaic grid-connected, solar photovoltaic isolated, and thermal solar energy (Bortoluzzi *et al.*, 2021; Karunathilake *et al.*, 2019; Pang *et al.*, 2022). This energy source is one of the most rapidly expanding clean sources of global energy production. (ii) Wind energy is the utilization of wind power to generate electricity for residential and industrial use (Konneh *et al.*, 2019; Ren and Lutzen, 2017). A wind turbine is utilized for the conversion of wind energy to electricity. The wind operation can primarily be used as a small-scale wind energy system, which supplies specific regions, and a wind-connected energy grid system, which makes it possible to construct electricity grids similar to wind farms (Bortoluzzi *et al.*, 2021; Yazdani *et al.*, 2018).

Wind and solar energies are two sources of clean energy, but they are weather-dependent. Thus, it is essential to

consider weather changes when choosing such energy sources (Campos-Guzmán *et al.*, 2019). It is important to note that solar and wind energy are regarded as variable renewable energy (VRE), or intermittent renewable energy sources (IRES) because they are not dispatchable due to their fluctuating nature. The penetration of intermittent renewables in most power grids is low: global electricity generation in 2021 was 7% wind and 4% solar. However, in 2021 Denmark, Luxembourg and Uruguay generated over 40% of their electricity from wind and solar (Global Energy Review, 2022).

(iii) Geothermal energy is heat from the hot interior of the earth or near the earth's surface. Geothermal energy from deep underground is used to generate electricity. The near-constant temperature of the earth near the earth's surface is used in geothermal heat pumps for heating and cooling buildings (EIA, 2023). Geothermal energy can provide industrial-scale electricity and heat (Rani *et al.*, 2019). Given its vast geological features, Africa has a huge potential for producing geothermal energy, but the potential is currently largely unutilized. (iv) Biomass energy is derived from both plant and animal sources; it is a source of renewable energy derived from non-fossilized plant materials. The energy is produced through the combustion of wood, agricultural residues such as crop and animal waste, and other organic feedstocks (Osman *et al.*, 2019a). Biomass pyrolysis produces biochar that can be used effectively for climate change mitigation as a readily available negative emission technology; this is in addition to the renewable energy produced from the process in the form of excess heat (Fawzy *et al.*, 2022; Osman *et al.*, 2022). Energy from waste can be considered a subset of biomass energy when waste derived from animal, human, or vegetable sources is considered (Akor *et al.*, 2021; Al-Wahaibi *et al.*, 2020; Osman *et al.*, 2019b). Figure 1 provides a schematic framework for the classification of renewable energy based on a review of relevant literature on renewable energy.



**NOTE:** Hydropower electricity can be classified as either constant or controllable Renewable Energy depending on:

- Pumped storage system
- Small hydropower plants
- Cascaded reservoir hydropower plant

**Figure :** A schematic framework for the classification of renewable energy sources

**Source** Author's Design (2023)

According to the United States Energy Information Administration (2023), biomass energy is categorized into three main types, namely: (a) biofuels which include ethanol, biodiesel, renewable diesel, and other biofuels that are mostly used for transportation, (b) municipal solid wastes and biogas which biomass (or biogenic) materials and non-biomass combustible materials (mainly plastics and other synthetic materials made from petroleum). MSW or garbage is burned in waste-to-energy plants to generate electricity, and (c) wood which is made up of, first, residues from forestry operations and lumber, paper, and furniture mills for use as industrial process heat and to generate electricity and, second, fuel wood and wood pellets for space heating and cooking in homes and businesses.

(v) Hydropower is obtained by converting the potential energy of water into kinetic energy (Çolak and Kaya, 2017). Hydroelectricity is generated by constructing dams on rivers. Water at a greater altitude is precipitated onto the hydro-turbine, which generates electricity. Hydroelectricity generates approximately 1150 gigawatts globally and is the largest renewable energy source (Rahman *et al*, 2022). Compared to other RE sources, hydropower generates electricity with the highest conversion efficiency, which is about 90%. Hydropower contributes 20% of electricity generation worldwide. Hydropower systems can be modified to meet the loading requirement with maximum capacity factor, thus there are various types of hydropower such as pumped storage systems, small hydropower plants, and cascaded reservoir hydropower plants (Tze-Zhang *et al*, 2022).

### **General Overview of Climate Change Impact in Africa**

Climate change is long-term shifts in temperature and weather patterns and it represents one of the major threats to Africa achieving the Sustainable Development Goals, especially the quest for Goal 13 – Taking Climate Action. The Intergovernmental Panel on Climate Change (IPCC) report 2018 highlighted the grave consequences of a temperature increase above 1.5°C, especially for Africa. According to the Intergovernmental Panel on Climate Change (2007), climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and /or the variability of its properties, and that persists for an extended period typically decades or longer. Although the length of time it takes the changes to manifest matters, the level of deviation from the normal and its impacts on the ecology are paramount. This prompted Ayoade (2003) to state that secular variations in climate occurring throughout 100 to 150 years may not qualify as a climate change if conditions will quickly reverse later, but a climate change usually takes place over a long period of at least 150 years with clear and permanent impacts on the ecosystem.

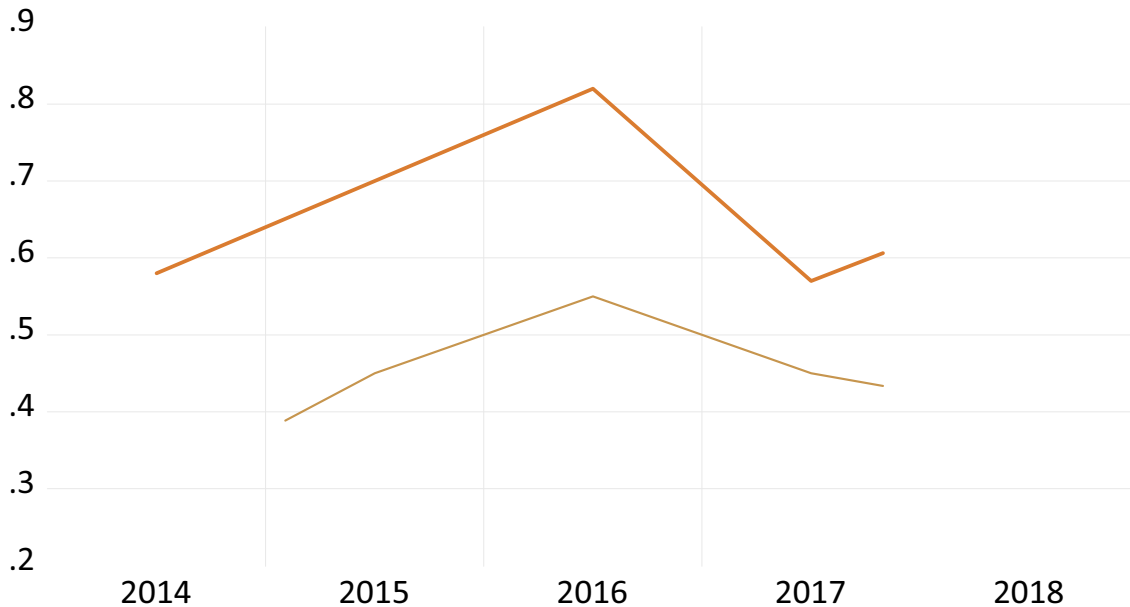
On a per capita basis, Africa contributes the least to global climatic change. This is primarily because of the region's overall low levels of industrial development (May and Caron 2009). Less than 3% of the world's total emissions of greenhouse gases emanate from the African continent. The rich countries dominate the overall emissions account; collectively, they are responsible for approximately 7 out of every 10 tonnes of CO<sub>2</sub> that have been emitted since the start of the industrial era, with those emissions being highly concentrated in a small group of countries (UNDP 2007). The top 10 emitters are responsible for over 60%; the top five emitters (China, India, Japan, the Russian Federation and the United States) account for more than 50%; and the United States is the largest emitter, accounting for around 20% of the total (UNDP 2007).

Highlighting the severity of climate change on the African continent, the Global Citizen Report (2023) identified 7 more devastating facts about how climate change is impacting Africa the hardest: (1) Almost a quarter of a billion Africans will face water scarcity by 2025, (2) 5 of the 10 countries most impacted by climate change are in

Africa, according to the 2021 Global Climate Risk Index (3) Tropical storms in Southern Africa displaced half a million people in just three months this year, (4) 46 million people do not have access to enough food in the Horn of Africa and Sahel Region, (5) Hundreds of billions of locusts swarmed East Africa in 2020, (6) 86 million Africans could be forced to leave their homes in 2050, and (7) 1 in 3 deaths from extreme weather happen in Africa.

Figure 2 below shows the recent warming levels of the globe and Africa from 2014 to 2018 based on research by the African Centre of Meteorological Applications for Development (2019).

and there is a clear indication that Africa is warming faster than the rest of the world on average.



**Figure 2:** Recent Warming Levels of the Globe and Africa

**Source:** Authors' Design (2023)

Table 1 depicts the 10 warmest years on record over Africa and it is clear that there is a general warming trend at the continental level. For example, of the 10 warmest years on record in Africa, 9 warmest years have been observed in the last 10 years (Table 4). Based on NOAA data, the warming rate over the past 69 years is about 2.14 °C/century. Considering the past 28 years, the warming rate is 3.57 °C/century (Figure 1). With this warming trend, Africa may reach 2 °C warming above the 1981-2010 average in the next few decades.

**Table 1:** 10 Warmest Years on the Record over Africa

<b>Year</b>	<b>Anomaly with respect to 1981-2010 (° C)</b>
2010	+0.90
2016	+0.83
2015	+0.71
2018	+0.70
2017	+0.60
2014	+0.59
2005	+0.56
2009	+0.55
2013	+0.51
1998	+0.41

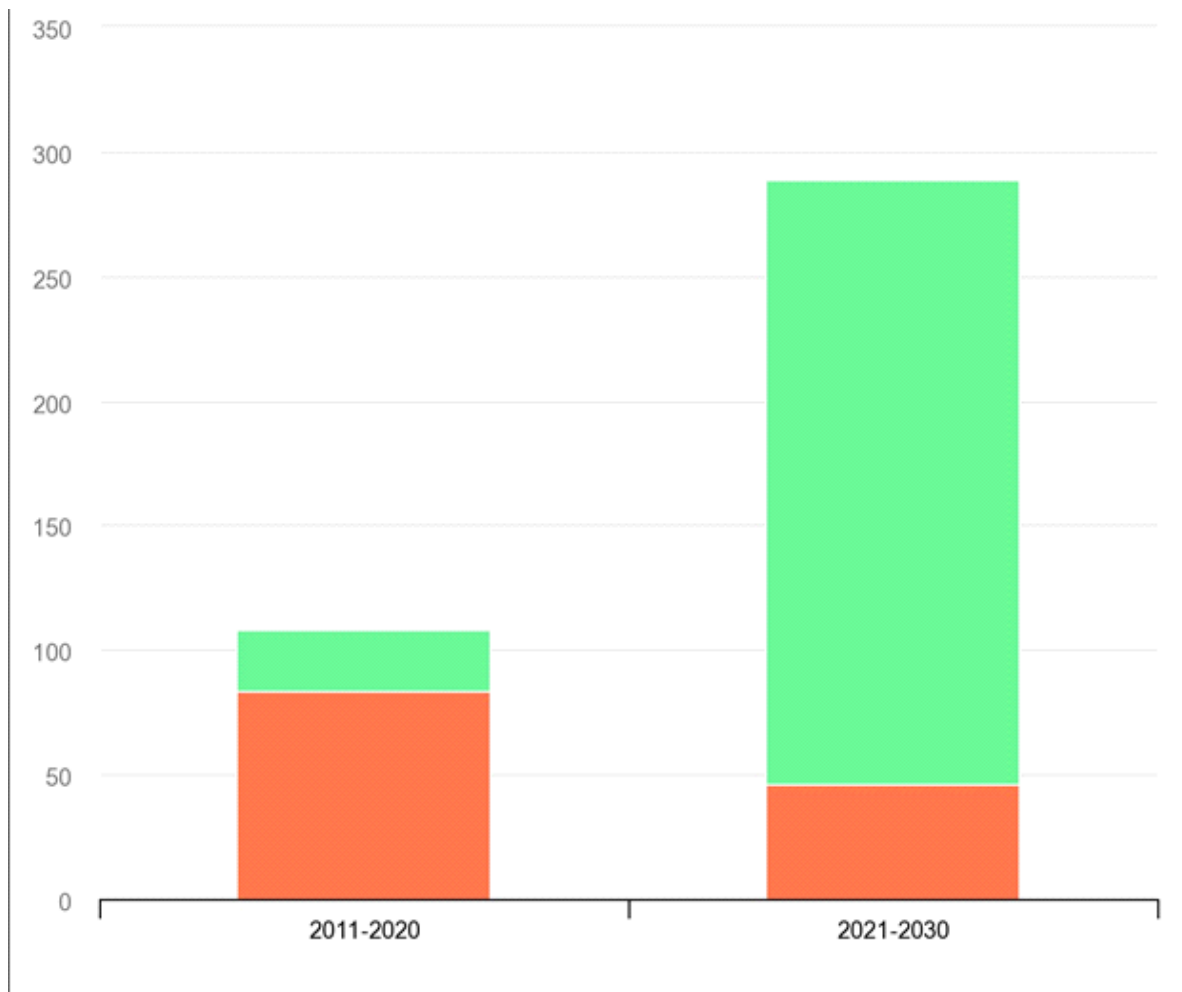
**Source:** African Centre of Meteorological Applications for Development (2019)

During year 2018, temperature anomalies exhibited varying warming levels over the different sub-regions of Africa. Over Northern Africa, the average temperature anomaly was 0.84 °C warmer than the long-term mean. As such, the year 2018 was ranked as the 3rd warmest year on record in this region since 1950. The rate at which temperature has been increasing in this region over the period; 1950-2018 and 1990-2018 was found to be 2.3 °C and 4.29 °C per century, respectively (ACMAF, 2019).

### **The Need for Transitioning to Renewable Energy Sources in Africa**

Almost 80% of the global population lives in countries that are net importers of fossil fuels (IRENA 2022). Ironically, renewable energy resources are available in all nations, waiting for their full potential to be exploited. The International Renewable Energy Agency estimates that by 2050, 90% of the world's energy can and should come from renewable sources (IRENA 2018).

However, the excessive use of fossil fuels and non-renewable energy sources by developed and emerging economies to propel industrial and economic growth contributes to global warming by emitting large quantities of greenhouse gases and mitigating the perilous impacts of greenhouse gas emissions from energy production and consumption is crucial to combating climate change to achieve the UN Net Zero in line with the Paris Agreement which is seeking to reduce global GHG emissions by 45% by 2030 and reach net zero by 2050. The urgency to combat climate change and achieve sustainable development strengthens the global renewable energy transition momentum in an era of global environmental degradation. A sustainable energy future is within reach due to the development of green buildings, green energy and power use in industry, green transportation, decreased costs of renewable energy, increased energy efficiency and continued technological advancements, and informed policymaking (Osman *et al* 2022).



**Figure 3:** Power Generating Capacity Additions in Africa in Sustainable Africa Scenario 2011-2030

**Source:** International Energy Agency (2022), **Note:** **Green** – Fossil fuels, **Orange** – Renewable

The global shift from fossil-based energy systems is gaining substantial traction, but it must accelerate to contribute to global sustainable development. African countries need to do more to incorporate renewable energy into their energy mix to make the energy transition more seamless. According to the development and research on the use of renewable energy in critical sectors (Karunathilake *et al* 2019), renewable energy can be used to replace fossil-fuel energy in four key sectors, namely: construction industry, power plants, transportation, and the industrial sector. The benefits of deploying renewable energy in these sectors include but are not limited to saving money and protecting the environment from the danger of fossil fuel emissions; they are cleaner, reliable, versatile, and lower in costs compared to fossil fuel alternatives. Renewable energy has the potential to provide electricity to the 600 million Africans currently deprived of it, create jobs, and stimulate industrialization.

## Theoretical Framework

### *Theoretical Framework*

The theoretical framework of this study is based on an extended version of the Environmental Kuznets curve (EKC). According to EKC, as an economy develops production levels and carbon emissions increase together. However, at a higher level of economic development input mix changes because of the availability of clean technologies such as renewable energy, thereby reducing carbon emissions (Grossman and Kruger, 1991). The baseline equation is based on the model used by Holtz-Eakin and Selden (1995), Chandran and Tang (2013), Kasman & Duman (2015), Bilgili *et al.* (2016) and Majeed (2018).

$$(\text{Environmental Degradation})_{it} = f(\text{GDP}, \text{GDP}^2)_{it} \quad (1)$$

This study revisits EKC incorporating the role of renewable energy in explaining environmental degradation. The use of renewable energy leads to environmental improvement as it is the cleanest form of energy and does not lead to emissions and resource depletion. Solar and wind energy are the cleanest form of energy. Unlike fossil fuels, renewable energy is inexhaustible. The role played by renewable energy in mitigating environmental degradation has been explored by Bilgili *et al.* (2016) and Zoundi (2017) among others.

With exponential population growth and poor rural conditions, rural-urban migration takes place. The reasons behind rural-urban migration are the provision of facilities such as education, jobs, and medical among others. This rural-urban migration puts pressure on limited resources available in urban areas amplifying overexploitation and environmental degradation. Urbanization puts pressure on water resources to meet the demands of an increasing population. Therefore, urbanization coupled with a rapidly increasing population leads to overexploitation of water resources for drinking, domestic, sanitation, and hygiene. In such a scenario, demand for food, transportation, and energy increases, thereby overburdening the environment.

## Methodology

The study employed descriptive quantitative analysis using secondary data and data-based evidence from a wide range of sources. The method of data analysis is the descriptive method which involves presenting, organizing and summarizing the data sets with the aid of such tools as charts, trend graphs, tables and figures to analyse the data set relevant to the period of review. The quantitative aspect employed such parameters as the means, frequency distribution, and simple percentages to explore observable trends in our variables of interest. The sources of data employed in our analysis are as follows: The data set on renewable energy indicators was obtained from the International Renewable Energy Agency (IRENA), the World Resources Institute (WRI), and the International Energy Agency (IEA) databases; data on climate change indicators and data on the environmental impact of renewable energy usage were sourced from the Intergovernmental Panel on Climate Change (IPCC), the Global Centre on Adaptation (GCA) and IMF Climate Change and the African Centre of Meteorological Applications for Development (ACMAD).

## Cost of Renewable Energies

In this section, we attempt to analyse the cost of only three renewable energy sources – solar, hydropower, and biomass renewable energies. Other sources of renewable energy are not considered because the current state of renewable energy technology in Africa has not supported the development of other renewables such as wind, nuclear, and geothermal (except in Kenya where geothermal is 53% of renewable energy) energy.

Table 2 and Table 3 show the renewable energy installed prices and the levelized cost of electricity. The levelized



cost of electricity (or the levelized cost of energy) is a measurement used to assess and compare alternative methods of energy production. All renewable energy prices were reduced in 2021, except for geothermal and hydroelectric energy. The cost of solar and wind-generated electricity per kilowatt-hour in Europe in 2021 would be four to six times less than that of fossil fuels in 2022. Given the crisis in fossil fuels, the new renewable capacity added in 2021 could reduce electricity generation costs by \$55 billion in 2022. Between January and May of 2022, wind and solar generation alone in Europe prevented at least \$50 billion in fossil fuel imports.

**Table 2:** Renewable Energy Installed Prices

Renewable Source	Overall investment cost (\$/kilowatt)	Overall investment cost (\$/kilowatt)	
	<b>2010</b>	<b>2021</b>	<b>Change (%)</b>
Bioenergy	2714	2353	-13
Geothermal	2714	3991	47
Hydropower	1315	2135	62
Solar Photovoltaics	4808	857	-82
Concentrated Solar Power	9422	9091	-4
Onshore wind	2042	1325	-35
Offshore wind	4876	2858	-41

**Source:** International Renewable Energy Agency (IRENA) (2022)

**Table 3:** Levelized Cost of Energy (\$/kilowatt)

Renewable Source	Levelized cost of electricity (LCOE)* (\$/kilowatt)	Levelized cost of electricity (LCOE) (\$/kilowatt)	
	<b>2010</b>	<b>2021</b>	<b>Change (%)</b>
Bioenergy	0.078	0.067	-14
Geothermal	0.050	0.068	34
Hydropower	0.039	0.048	24
Solar Photovoltaics	0.417	0.048	-88
Concentrated Solar Power	0.358	0.114	-68
Onshore wind	0.102	0.033	-68
Offshore wind	0.188	0.075	-60

**Source:** International Renewable Energy Agency (IRENA) (2022)

**\*Note:** The levelized cost of electricity (LCOE) is defined as the price at which the generated electricity should be sold for the system to break even at the end of its lifetime. It is calculated by first taking the NPV of the total cost of building and operating the power-generating assets and then dividing the result by the total electricity generation over its lifetime.

Africa has more than 39% of the world's renewable energy potential, more than any other continent and these renewable energy sources are mainly derivable from three major sources, namely: solar, biomass and hydropower.

## Cost of Solar Energy

By 2021, over 843 gigawatts of solar photovoltaic systems had been installed worldwide, representing a 21-fold increase in solar energy since 2010. In addition, 133 gigawatts of newly installed systems were established during 2021 alone, which was a 13% increase from 2020. These new capacity additions were the highest among all renewable energy sources that year (IRENAa, 2022).

Solar energy costs must be quantified to promote the benefits and future of renewable energies. The levelized cost of energy (LCOE) of crystalline and amorphous silicon photovoltaic panels in different local climates was the subject of one study. The LCOE and lifetime of the crystalline silicon panels were \$0.143 (21 years), \$0.138 (32 years), \$0.172 (25 years), and \$0.159 (40 years) for mid-altitude desert, humid subtropical, humid continental, and maritime climates, respectively (Flowers et al., 2016). The amorphous silicon panels had LCOE values and life spans of \$0.141 (17 years), \$0.201 (14 years), and \$0.227 (17 years) for mid-altitude desert, humid subtropical, and maritime climates, respectively. The study identified crystalline silicon panels as the most viable due to their low degradation rates. Another research studied the LCOE of bifacial solar farms considering land and module costs. The research suggested that for places with limited and expensive land, solar panels should be laid flat to maximize land utilization (Osman, *et al.*, 2023).

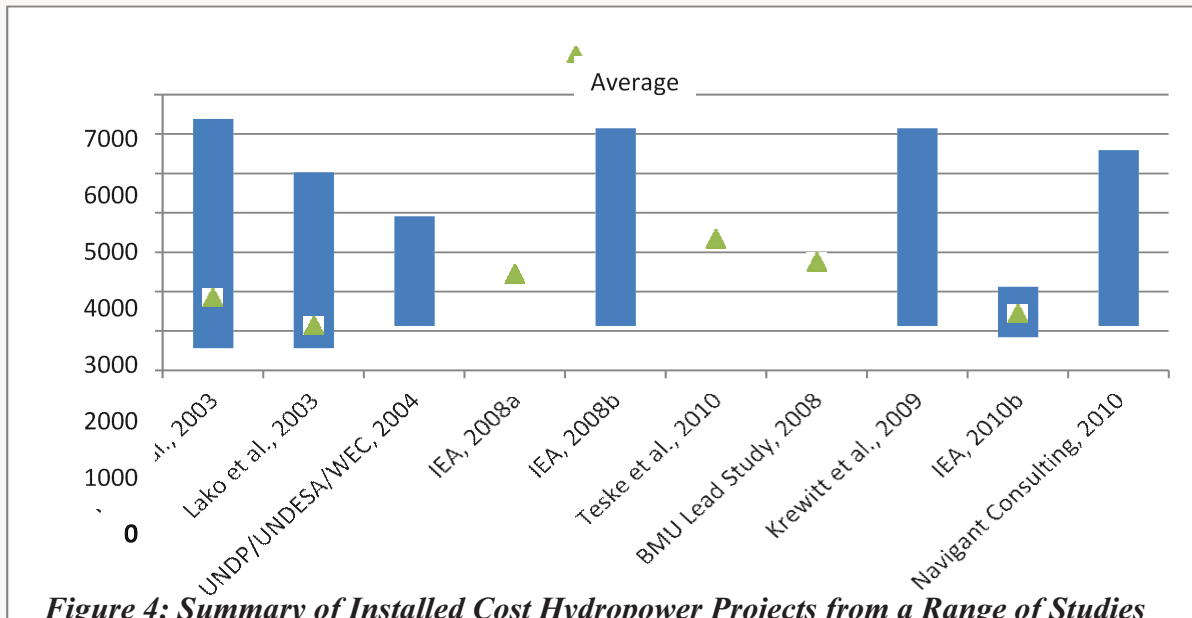
Solar PV module prices declined by around 80% between 2009 and 2015 (Figure 11). In 2011, price declines accelerated as oversupply created a buyer's market. The price declines then slowed between 2013 and 2015 as manufacturer margins reached more sustainable levels and trade disputes set price floors in some markets. During Q1 2015, solar PV module prices continued declining by about 15% for crystalline modules and by a slower 4% for thin-film modules. Module prices stabilized during Q3 and Q4 2015, with crystalline modules increasing slightly. Thin-film module prices continued their downward trend and decreased by 3% during Q2, Q3 and Q4 2015. During early 2016, thin-film prices have stayed around USD 0.5/W. During 2015, weighted average country-level module prices ranged from around USD 0.52 to USD 0.72/W

Finally, the implications for Africa from these observations and analysis are significant. They highlight that a large gap can exist between what a hypothesized “efficient” cost structure in African countries may look like and what is achievable on the ground given local market maturity, structural cost factors and the impact of the regulatory framework. There is a tendency among many commentators and researchers to be overly optimistic about what average solar PV installed costs may look like in Africa (and indeed elsewhere), particularly for small-scale projects and residential systems, as deployment grows. The difficulties of rapidly establishing an efficient cost structure given all of the challenges involved can be large. This is not to say that they are unreasonable assumptions for a longer-term, more established market situation, but that there often is a tendency to underestimate initial levels (IRENA, 2023).

## Cost of Hydropower Energy

Hydropower remains the lowest-cost source of electricity globally, and Africa is no exception. Hydropower production costs depend on the construction, equipment, operation, and maintenance expenses. Micro hydropower plants are necessary for rural and underdeveloped areas to have access to electricity. The cost of micro hydropower plants utilizing locally manufactured equipment was quantified in Nepal. The results showed that the average price per kilowatt at Crossflow and Pelton sites were \$505/ kilowatt and \$605/kilowatt,

respectively (Butchers et al., 2022). The generator, penstock, and turbine sub-systems account for almost half of the total costs of the hydropower plant sub-systems. The initial cost of a micro-hydropower plant is around 6 cents/hour, while solar and wind plants cost 10 cents/hour and 7 cents/hour, respectively (Elbatran *et al.*, 2015). The cost of starting up a mi-hydropower plant is divided into civil works (40%), turbine and generator (30%), control equipment (22%), and management cost (8%). The initial costs of construction and equipment for



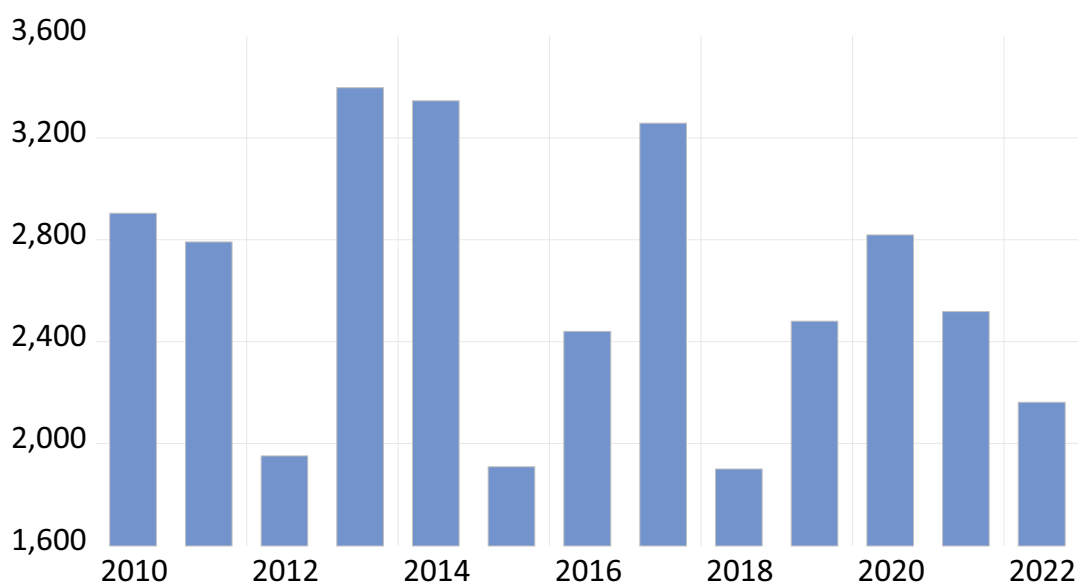
**Figure 4: Summary of Installed Cost Hydropower Projects from a Range of Studies**  
**Source:** IRENA (2021).

Figure 4 summarises several studies that have analysed the costs of hydropower plants. A large, comprehensive cost analysis of over 2 155 potential hydropower projects in the United States totalling 43 GW identified an average capital cost of USD 1 650/kW, with 90 % of projects having costs below USD 3 350/kW (Hall, et al., 2003). In another study (Lako et al., 2003), 250 projects worldwide with a total capacity of 202 GW had an average investment cost of just USD 1 000/kW and 90 % had costs of USD 1 700/kW or less (Lako et al., 2003).

### Cost of Biomass Energy

**Figure 4: Summary of Installed Cost Hydropower Projects from a Range of Studies**  
**Source:** IRENA (2021).

Available low-cost biomass, such as agricultural by-products, provides highly competitive, dispatchable sources of electricity. However, transportation costs are responsible for the high price of biomass. In Switzerland, research has been conducted on the transport of biomass, including firewood, woodchips, and solid and liquid manure, along various transport chains. The results revealed that transportation costs ranged from 24 Swiss francs/ton of dry matter for the transport of slurry by underground pipe to 340 Swiss francs/ton of dry matter for transporting coniferous wood by farmers (Schnorf *et al.*, 2021).



**Figure 5:** Average Installation Cost of Bioenergy Plants Worldwide from 2010 to 2022 (in US dollars per kilowatt) **Source:** Statista (2023)

Figure 5 shows the global average cost of installing bioenergy plants from 2010 to 2022 in US\$ per kilowatt and it indicates that the average cost of installing bioenergy plants in 2022 is 2,162 US dollars per kilowatt installed. The trend shows that there are sharp fluctuations in cost over the years with the highest cost being recorded in 2013 with \$3.397 installation cost per kilowatt. Although there are many possible factors influencing cost of biomass energy, the main three drivers are equipment cost from the factory gate to the delivery site, total installed project cost (including fixed financing cost) and the levelized cost of electricity (LCOE) generated. According to IRENA (2023), the LCOE of biomass-fired power plants range from 6 to 29 cents per kWh based on capital costs and feedstock costs. Where low-cost feedstocks are available and capital costs are modest, biomass can be a very competitive power generation option, according to the analysis, and where low-cost agricultural or forestry residues and wastes are available, biomass can often compete with conventional power sources. Even where feedstocks are more expensive, the LCOE range for biomass is still more competitive than for diesel-fired generation, making biomass an ideal solution for off-grid or mini-grid electricity supply.

## Impact of Renewable Energy on the Environment

According to the World Health Organization, nearly 99% of the world's population breathes unhealthy air, and more than 13 million people die annually from preventable environmental causes, including air pollution (World Health Organization, 2022). Primarily, the combustion of fossil fuels generates fine particulate matter and nitrogen dioxide. In 2018, air pollution from fossil fuels caused daily health and economic losses of approximately \$8 billion (United Nations a, 2018). Switching to renewable energy sources, such as solar and wind, aids in combating climate change, air pollution, and health problems (Osman *et al.*, 2023).

Table 4 examines the environmental impact of renewable energy deployment on the environment. The table summarizes the environmental benefits and hazards of continuous and expanding use of renewable energy in

various regions and time periods.

**Table 4:** Environmental Impact of Increasing Renewable Energy Sources

Project Title	Year	Environmental Impact	Region	References
Heterogeneous impacts of renewable energy and environmental patents on carbon dioxide emission—Evidence from the BRICS (Brazil, Russia, India, China, and South Africa)	2019	+	BRICS (Brazil, Russia, India, China and South Africa)	Cheng <i>et al</i> (2019)
Social, economic, and environmental impacts of renewable energy systems	2009	-	Uttaranchal state, Tehri Garhwal district, Jaunpur block, India	Akella <i>et al</i> (2009)
Environmental impacts of high penetration renewable energy scenarios for Europe	2016	+	Europe	Berrill <i>et al</i> (2016)
Does nuclear and renewable energy improve the environment? Empirical evidence from the USA	2016	+	USA	Baek (2016)
Impact of renewable energy consumption, globalization, and technological innovation on environmental degradation in Japan: application of wavelet tools	2021	+	Japan	Adebayo and Kirikkaleli (2021)
Economic and environmental benefits of increasing the renewable energy sources in the power system	2019	+	Egypt	Nassar <i>et al</i> (2019)

\* **Note:** "+" represents a positive impact, while "-" represents a negative impact.

**Source:** Adapted from Osman *et al* (2023).

Furthermore, on a general note, renewable energy utilization can be said to have little or no hazardous effect on the quality of environmental conditions. This perspective is corroborated in the literature as the extant literature of renewable energy highlights various mechanisms through which renewable energy helps to improve the quality of the environment. First, renewable energy does not emit pollutants and therefore the quality of the environment does not deteriorate. Second, renewable energy lowers environmental degradation because of the “substitution effect”. That is, renewable energy is substituted with fossil fuels and the prospective emissions of fossil fuels are diminished (Bilgili *et al.*, 2016).

Third, renewable energy does not deplete unlike fossil fuels (Akella *et al.*, 2009; Tsoutsos *et al.*, 2005) and, therefore, does not burden the environment by freeing the resources from extraction and mining activities. Fourth, renewable energy improves the quality of the environment by generating dynamic effects through

economies of scale and spillover effects. According to technological transfer theory, the “horizontal” or international perspective of technology transfer “enables developing countries to acquire, adapt, deploy and diffuse renewable energy technologies from overseas and further innovate as a result of the capabilities acquired through the technology transfer process”.

Renewable energy sources “such as solar, wind, geothermal, biomass and small hydropower plant” ensure the sustainability of energy and are inexhaustible, unlike fossil fuels which deplete (Tsoutsos *et al.*, 2005). Renewable energy ensures energy security and sustainability (Prandecki, 2014). Among renewables, solar energy is extensively available and has the potential to meet the growing energy demand and to slow down climate change as it does not produce emissions. Solar energy is the cleanest form of energy that has the least environmental impact. The solar energy capacity of the world has increased. Solar energy is not vulnerable to weather patterns. Solar energy does not lead to any gaseous emissions to air or generate liquid and solid waste thus improving the environment (Devabhaktuni *et al.*, 2013; Bhattacharyya, 2011; Solangi *et al.*, 2011).

In addition, renewable energy has spillover effects. Because of the decentralized nature of renewable energy, it increases job opportunities and can easily be applied with low maintenance cost which leads to spillover effects (IRENA, 2019). Dependence on imports of fossil fuels affects trade balance and leads to macro-economic instability whereas harnessing renewable energy reduces the vulnerability of the economy to external economic shocks. Renewable energy increases employment opportunities because of its decentralized nature. Off-grid solar units can be installed in rural communities and far-flung areas, which lack electrification. Off-grid units have ensured access to energy which improves businesses and employment opportunities (IRENA, 2016).

Furthermore, as found out by Asongu, Iheonu and Odu (2019), the fact that renewable decreases CO<sub>2</sub> emissions is an indication that to mitigate CO<sub>2</sub> emissions in Africa in the light of sustainable development goals (SDGs) about energy, sampled policies will need to tailor policies that favour the replacement of non-renewable resources of energy with renewable sources. Some policies that can be implemented in this direction include making environmentally conscious political decisions aimed at encouraging the use of green energy sources such as solar and wind power for electricity generation. Adopting green energy sources in the industry also reduces CO<sub>2</sub> emissions as the industry is one of the leading contributors of CO<sub>2</sub> emissions not just in Sub-Saharan Africa but also in the rest of the world. Governments should also study the feasibility of the use of electric cars in the region and the possible adoption of such cars for CO<sub>2</sub> emissions to be reduced.

In contrast, some studies also argue that renewable energy can also negatively affect the quality of the environment. Combustible renewables and waste are not clean energy use. If they have a major share in renewable energy sources then emissions can increase (Jebli and Youssef, 2017). “Renewable energy sources, such as biofuels, solar, wind and geothermal energy, require a substantial amount of water and land”. Given the limited availability of land and water resources, renewable energy resources will increase the ecological footprint, thereby degrading the environment (Al-Mulali *et al.*, 2016). Using a sample of 58 countries from 1980 to 2009, Al-Mulali *et al.*, (2016) confirm that renewable energy increases ecological footprint by increasing the inefficiency of land and water use and therefore degrade the environment.

In conclusion, there seems to be no consensus regarding the impact of renewable energy on emissions and the consequent impact on the environment, however, the existing evidence on the positive effects of renewable energy on the environment outweighs the evidence of its harmful effects. Therefore, the current study occupies a unique position in the literature by contributing to the existing debate of the energy-environment nexus, as the

availability of renewable energy sources is not constrained like fossil fuel which depletes and degrades the environment. Moreover, renewable energy ensures energy sustainability and security as well.

### **An Assessment of Climate Resilience in Africa**

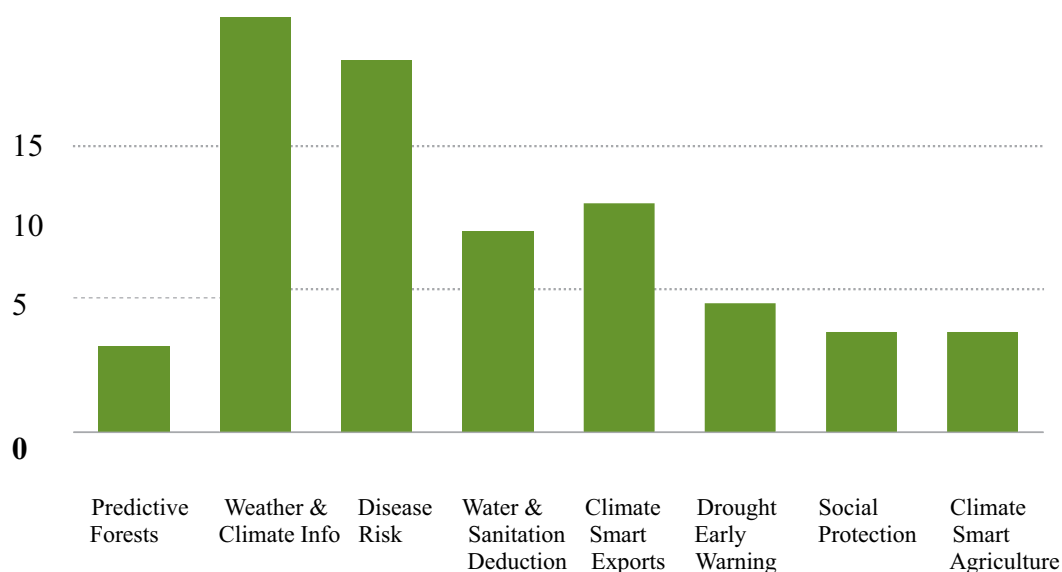
Resilience is an important and desirable feature of an efficient energy system and an energy system is said to be efficient when it possesses the ability to withstand the gradual long-term changes in climate patterns and continue operation after severe disruptions. According to the African Development Bank (2023), “Of all continents, Africa is least responsible for climate change. It has contributed only a minute part (far less than 4%) of the Greenhouse gas emissions that are responsible for the climate emergency the world faces today. Yet, Africa faces a more arduous battle than the rest of the world to tackle the impacts of climate change and to make itself resilient to climate change. Climate resilience is about successfully coping with and managing the impacts of climate change while preventing those impacts from growing worse. A climate-resilient society would be low-carbon and equipped to deal with the realities of a warmer world.

Today, Africa remains one of the most vulnerable and the least climate-resilient regions in the world. This is manifest across all corners of the continent. In the Horn of Africa, millions are threatened as a historic drought looms. In the Sahel, climate change is fueling insecurity because of increasingly scarce resources. And Southern Africa is experiencing lethal rain and floods. Action has never been more urgent. These climate change-induced challenges cut across many countries and subregions of the continent and have triggered a wide range of socio-economic challenges including considerably slowing down Africa's economic growth trajectory with average annual losses in GDP per capita growth of 5–15 per cent in 1986–2015. These losses stem largely from differences in economic structure and exposure to climate change. The economic cost is projected to be much higher in the next few decades. The future climate-induced macroeconomic risk for African countries was estimated to be higher than the rest of the world under two Representative Concentration Pathways – RCP 2.8 and RCP 8.5.

Carleton *et al* (2020) submit that Beyond macroeconomic impacts, climate change has significant impacts on socioeconomic outcomes. For instance, the average global risk of mortality from high temperatures amounts to an additional 85 deaths per 100,000 people in 2100, but the effect is worse in Africa. In Ghana and Sudan, for instance, high temperatures could be responsible for an additional 160 and 200 deaths per 100,000, respectively, in 2100. High-temperature projections for that year would raise the prevalence of child-wasting among children under the age of five by 37 per cent in West Africa and by 25 per cent in Central Africa and East Africa (Baker and Anttila-Hughes, 2020).

In addition, the risk of climate-change-related conflicts such as fighting over scarce water resources, are increasing (IDMC, 2021). A 1°C higher temperature is associated with a greater risk of conflict in Africa of about 11 per cent since 1980. In 2020, 30 million people worldwide became internally displaced as a result of weather-related disasters, including 4.3 million in Africa, the highest level since 2012-suggesting that climate-related disasters lead primarily to internal rather than international migration, particularly in developing countries (IMF, 2020). Extreme weather events account for 89 per cent of all disease displacement in most African countries, they lead to higher rural-urban migration because of the effects on agriculture. Further, internally displaced people struggle to find safety in camps, tents, and makeshift shelters, often for uncertain and prolonged periods. Lacking privacy for daily activities such as bathing, sleeping, and dressing, the camps become an ungoverned place for increased sexual violence. Many women and girls have reported heightened

exposure to gender-based and sexual violence when living in makeshift camps with very little protection (Desai and Mandal, 2021).



**Figure 6:** Cost-benefit ratios for Climate-resilient Options in Africa

**Source:** Adapted from Global Center on Adaptation (2021).

*Note:* The figure shows averages of a range of indicative benefit–cost ratios reported in the source. These ratios are highly site- and context-specific, and future uncertainty about the scale of climate change could affect them greatly.

It is evident that Africa has a low adaptive and climate-resilience capacity and there is an increasing need to build efficient and cost-effective climate resilience to cover not only adaptation investments and costs but also losses and damages associated with residual damage and adaptation deficits. Considering the high vulnerability and low readiness of African countries (problems worsened by the impacts of the COVID-19 pandemic) and the limited contribution of Africa to climate change, Africa can become climate-resilient by adopting several strategies for climate change mitigation and adaptation. Social protection to support poor people during climate shocks also increases beneficiaries' resilience by minimizing associated losses as well as investments in resilient infrastructure, with measures to complement and upgrade the infrastructure to reduce the negative impacts of climate change on economic growth compared with a business-as-usual scenario of investments in standard infrastructure. Investing in resilient infrastructure also reduces inequality. Bridging the huge energy gap in Africa is one of the most viable strategies to improve Africa's low level of climate resilience and climate readiness. IEA (2019) states that as extreme weather events become more frequent and intense, the installation of residential and workplace climate control systems is important for building climate resilience among households and businesses requiring modern energy, but such efforts are held back by Africa's low modern energy production and consumption.

## Conclusion and Recommendation

This paper examines the cost and the environmental impact of renewable energy deployment in Africa as well as



Africa's climate change resilience and readiness under a changing global climate. We show that about 80% of the world's population resides in countries that are regarded as net importers of fossil fuels, leaving approximately 6 billion people susceptible to geopolitical shocks and energy crises. We consider the different types and forms of renewable energy that could be deployed for efficient and cost-effective energy transition. In contrast, renewable energy sources are available in all nations, but their full potential is not being adequately realized. Ironically, Africa has the most abundant renewable energy resources, but it has the least developed renewable energy utilization. By 2050, approximately 90% of the world's energy will come from renewable sources. Excluding geothermal and hydropower-derived energy, renewable energy technology costs in Africa (just like the rest of the world) have decreased significantly since 2010. In Africa, the cost of solar and wind-generated electricity per kilowatt-hour in 2021 was four to six times less than that of fossil fuels in 2022. With prices declining, new power supply based in renewable energy sources has a significant portion of the future to supply 65% of the world's total electricity by 2030 and to decarbonize 90% of the electricity industry by 2050. This is anticipated to stem the tide of carbon emissions thereby contributing to climate change mitigation and to the attainment of the UN Net Zero Agenda by 2050.

In explaining the impact of renewable energy sources on the environment, consideration is given to all renewable energy sources, including solar, wind, hydropower, geothermal, and biomass. Each renewable energy source has different environmental impacts depending on the renewable energy source type, location, scale, and implementation method. While almost all renewable energy sources have positive environmental effects, the negative effects can be mitigated through careful choice and utilization of renewable energy sources. Wind, hydropower, biomass, and geothermal energy were found to have the greatest environmental effects, while solar energy had the least effect on the environment and climate change. Among all regions, Africa is the least climate-resilient as extreme weather and climate fluctuations continue to cause immense socioeconomic damages resulting in huge economic losses and precipitous decline in GDP. The climate readiness of Africa is low in all ramifications compared to the rest of the world. Hence, renewable energy adoption is necessary for expanding and establishing renewables to reduce reliance on fossil fuels and save the environment, while climate-resilient options including bridging the huge energy gap in Africa will provide efficient and cost-effective strategies to enhance climate resilience in Africa.

To effectively achieve net-zero emissions by 2050, renewable energy sources must be solidly established in Africa by 2030 by ensuring the acceleration of its massive renewable energy resources. Africa must be given time to transit and be allowed to use natural gas as its transition fuel. Investment in renewable energy in Africa should be accelerated while financial and technical assistance is to be rendered to them given that the energy transition in Africa is estimated to cost \$100 billion annually between 2020 to 2050. It will be to Africa's benefit in terms of environment and economics to abandon the current overreliance on fossil fuels and invest more in renewable energy. National governments in Africa need to address key issues in the energy transition process which include – strategies for building a sustainable energy future for Africa, deregulation of the energy sector, utilizing gas as a transition fuel, sectoral challenges, local contents, the roles of national oil companies in the transition, etc. Policy reforms need to be geared toward encouraging fair conditions for all energy forms in terms of internalizing the environmental and economic costs of different energy types. An appropriate and market-determined energy pricing structure is fundamental to the emergence of a sustainable energy future in Africa.

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## Evaluation of Physicochemical Properties, Fatty Acid Profile and the Utilization Potential of *Terminalia catappa* Seed Oil in the Cosmetics Industries.

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### Abstract

*Terminalia catappa* Linn (Indian almond) is planted extensively in many countries. The seeds are edible but their domestic and industrial utilization is hampered by the difficulty of extracting the seed, thus creating an environmental nuisance during fruiting season. To enhance the utilization of the seed, this study evaluated the physicochemical properties and fatty acid profile of the *T. catappa* seed oil. It also assessed the quality of soaps and body creams produced with the oil. *Terminalia catappa* fruits were collected and sundried. The extracted seeds were either dried or roasted and oil was extracted with n-hexane, purified, and bleached. The physicochemical properties of the oil, the bar soap, and the body cream produced from the oils were determined. The fatty acid profile of the oil was determined using GC-MS analysis. The extracted oils from dried and roasted *T. catappa* seeds had physicochemical characteristics indicative of edible vegetable oil: free fatty acid (0.06%, 0.54%); saponification value (195.02, 190.26mgKOH/g); peroxide value (9.17, 9.38meq/kg); acid value (0.11, 1.07mgKOH/g); iodine value (93.59, 93.33wijs); and smoke point (172 °C, 170 °C). The fatty acid profile of both oils showed that oil from roasted *T. catappa* seeds contained mainly unsaturated fatty acids compared to the dried seed oil. Analysis of the body creams and soaps produced with the two varieties of oils showed that products containing roasted *T. catappa* oil had better parameters, but all the products were within the ranges recommended by the industrial standard specifications. The thermal stability and dermatological safety tests of both varieties of cream were satisfactory. These results demonstrated the suitability of the processed *T. catappa* seed oils for use in the food and cosmetics industries

**Keywords:** *Terminalia catappa*, Indian almond, physicochemical properties, fatty acid profile, cosmetics.

### Introduction

Fats and oils provide the highest energy density per weight individuals can consume (Valenzuela et al., 2020). Aside from being a source of stored energy, fat deposits insulate the body against heat loss and protect essential organs from mechanical harm (Lean, 2019). They are vital dietary sources for humans and are also widely employed for nutritional, aesthetic, and drug dispersion in treatments, as well as being an essential dietary source of key fatty acids like linoleic and arachidonic acids in addition to being used for industrial purposes (Burns et al., 2018).

Analysing the physicochemical characteristics of oils obtained from plant sources has become more important. It assists in ensuring that these oils satisfy legal requirements, are uncontaminated, and have the appropriate qualities for a variety of uses in sectors ranging from food and medicines to cosmetics and environmental sustainability. Some nut oils are edible while some are not (Al-Kheraif et al., 2021; Bai et al., 2018). The widespread use of these oils as essential components, in the commercial or chemical industry, has been



confirmed by numerous research (Al-Kheraif et al., 2021; Eduardo et al., 2021; Singh et al., 2019).

*Terminalia catappa* L. is a species of Combretaceae. It is popular in the tropics and is known as Indian almond or tropical almond (Donoso et al., 2018; Oudhia et al., 2008). It is also very nutrient-dense (Barku et al., 2012; Loveless, 1983). The tree is frequently planted primarily for shade, ornamental, and nut-eating purposes. *Terminalia catappa* ripe fruit has an edible nut that tastes like that of almonds (Ravi, 2020). However, the nuts' diminutive size and difficult procedure for extraction have been noted as probable causes for their underutilization (Ladele et al., 2016; Thomson et al., 2006), thus creating an environmental nuisance during fruiting season.

The bulk of oils obtained from animals (butter, cheese, and whole milk) and plants such as palm oil, coconut oil, and palm kernel oil are quite high in saturated fats compared to tropical almond oil. Saturated fats on the other hand have been known to raise cholesterol levels by inhibiting the LDL receptors which take the cholesterol out of the blood and into the liver to be broken down, resulting in heart disease and stroke (Agunbiade et al., 2006).

*T. catappa* seed is rich in vitamin E, low in saturated, and high in unsaturated fatty acids (Orhevba et al., 2016). This oil offers a lot of health benefits when added to foods such as salads, rice, stew, and a variety of other foods. *Terminalia catappa* oil has numerous attributed health-positive effects, such as its capacity to reduce cholesterol in particular by reducing low-density lipoprotein (LDL) cholesterol while maintaining healthy high-density lipoprotein (HDL), easing inflammation, and stabilizing heart rhythms. *T. catappa* seed oil has been proposed as a likely source of nutritional oil (Jahurul et al., 2022; Janporn et al., 2015) and with high industrial potential (Adu et al., 2013). However, work on the physicochemical properties of cosmetic products from oven-dried and roasted *T. catappa* seed oil has not been published.

Therefore, the purpose of this work was to use oven-dried and roasted *T. catappa* seed oil as a main source of fatty material in bar soap and body cream formulations and to determine the quality characteristics of the oil, soap, and body cream produced.

## Materials and Methods

**Fruits collection and Pre-processing:** Fresh ripe *T. catappa* fruits were collected from various locations within the Lagos metropolis, the Lagos State University, Ojo campus, and its environs. The fruits were identified and authenticated (Voucher No: LSH 001172) by experts from the Botany Department of Lagos State University, Ojo, Lagos. Ethical approval was secured from the LASU Research Ethics Committee (Approval No: LASU/23/REC/07/001), before proceeding with this research. The fruit outer flesh was manually removed with a scalpel and the hard-shelled nuts were sun-dried for 7 days. The kernels (nuts) were extracted by manually breaking the dried shells with the aid of a vice. The total seeds were weighed and then portioned into two equal parts. A portion of kernels was dried in an oven at 125°C for 25 min, allowed to cool, then milled in a power blender and weighed. The second portion of seeds was transferred in batches into a stainless-steel frying pan and roasted over a smokeless flame for 20 min. After cooling, the roasted sample was likewise milled with a blender and weighed.

**Extraction and purification of oil:** The oil was extracted with n-hexane using a Soxhlet extractor. 100g of milled kernels were packed in the thimble of the Soxhlet extractor and the extractor was filled with 400 ml of n-hexane. Oil extraction was performed at the temperatures of 50°C, for 6hrs in two batches for both dried and

roasted samples. The oil yield obtained at the end of every extraction time for every extraction condition was calculated and recorded. After each extraction process, the solvent was removed in each case at 60 °C using a rotary evaporator. The solute-to-solvent ratio that was used for the entire extraction was 1:4 (100 g: 400 ml). The entire extraction process was carried out under every set of conditions in triplicates and the average values were reported.

The oil yield of *T. catappa* was calculated using the formula:

$$\% \text{Oil yield} = \frac{\text{Weight of oil extracted (g)}}{\text{Weight of } T. \text{ catappa seed (g)}} \times 100$$

The extracted crude oil samples were purified using the method of Ogunsua and Badifu (1989). Two millilitres (2ml) of distilled water were added to the crude Indian almond oil and heated at 70°C in a water bath for 30min. The substance, which comprises 0.07ml of acetic anhydride (C<sub>4</sub>H<sub>6</sub>O<sub>3</sub>), was left to cool after it had been shaken for 30 minutes at 70°C. The content was separated at 2000rpm by gradually pouring it for 30 minutes to enhance its gumming. After the oil has gummed, 7.55g, 1M potassium hydroxide (KOH) solution was added. The substance also underwent a ten-minute mixing process. This was done using Stuart's magnetic stirrer (model 8186) and the temperature of the mixing was 25°C. The congealing of the soap was also done by heating the mixture for 45 minutes at 80°C. The content was subsequently centrifuged for 20 minutes using a Heraeus sepatech centrifuge at 2000 rpm. 80 ml of distilled water was also used to wash the extracted substance. To do this, a separating funnel was used to forcefully stir the mixture and then allowed to rest for 15 minutes. Following that, the lower aqueous layer was dispersed and discarded. The oils obtained from the dried and roasted samples were labelled “degummed”.

To the degummed oil was added 0.56g of Fuller's earth and the mixture was heated for 10 min at 100°C. Thereafter, the mixture was vacuum filtered using Whatman No. 1 filter paper. Following an hour of bleaching with steam, the oil was dried in an oven (Gallenkanp model 300 plus) at 80 °C for 30 minutes.

Determination of Physicochemical Properties of *T. catappa* oil

*Physical properties*

*Refractive Index*

The refractive indices of the two varieties of *T. catappa* seeds oils respectively (at room temperature) were determined with an Abbey refractometer. The angle at which light is bent when it passes through a small layer of melted fat is known as the refractive index, and it is one of the physical characteristics of triglycerides. A typical fat's refractive index is determined by both its degree of unsaturation and glyceride structure. When fatty acids are unsaturated, their molecular weight causes the refractive index to decrease, and otherwise when saturated.

*Slip Melting Point*

This is the temperature at which oil begins to melt. This number indicates the types of fatty acids included in triglycerides. Low molecular weight and unsaturated fatty acids have low melting temperatures, while large molecular weight and saturated fatty acids have high melting points. To ascertain the sample's slip melting point, a differential scanning calorimeter (DSC; Diamond; PerkinElmer, Waltham, MA, USA) was used. (Janporn et al., 2015; Tan et al., 2000).

*Specific Gravity*

The Association of Official Analytical Chemists (AOAC) method No. 40.1.08 (1990)(AOAC, 1990) was used

to determine specific gravity. The following equation was used to get specific gravity:

$$\text{Specific gravity} = (W_1 - W_0) / (W_2 - W_0)$$

#### *Viscosity*

This is a measure of fluid's resistance to flow. The viscosity of dried and roasted *T. catappa* kernel oil was measured by utilizing Brookfield DV-I with a spindle of S00 at 100 rpm at room temperature.

#### *Colour*

The Hunter Lab DP9000 S/N 90905 was used to directly read the CIELab coordinates ( $L^*$ ,  $a^*$ , and  $b^*$ ) to identify its state and colour.

#### *Chemical Properties*

Acid value, free fatty acid, peroxide value, iodine value, saponification, and unsaponification values of the extracted oil were determined according to the AOAC official methods (AOAC, 1990).

#### *Fatty Acid Composition of the Extracted Oils*

The extracted oil samples were converted to Fatty acid methyl esters (FAMES) using the method described by (Hall et al., 1986; Oshodi, 1996). The fatty acid profile was determined according to AOAC 996.06 (AOAC, 1990). An HP 6890 gas chromatography system was used in the procedure to identify fatty acid methyl esters. The identified fatty acid methyl esters were evaluated with standard compounds. The percentage area of each fatty acid methyl ester was used to estimate the quality of each fatty acid.

#### *Production of Body Cream and Bar Soap*

The soap was produced using a modified soap cal.com formulation. 50g soap batches were produced respectively using the extracted oven-dried and roasted *T. catappa* seed oil. Water: lye ratio of 2.03:1. The product was allowed to cure by air-drying for 14 days before analysis was carried out (Shahinuzzaman et al., 2016).

The body cream was produced using a modified double boiler method and then blended with a stick blender. The cream produced was stored at 4°C in a refrigerator till further analysis (Suwandi et al., 2020).

#### *Quality Determination of Cosmetics Products*

##### *pH level test*

This was done using the pH meter (Inolab, WTW, Germany, pH 7310). One gram of soap or body cream was weighed out respectively, dissolved in ten millilitres of distilled water, and then the volume was adjusted to one hundred millilitres to produce a homogenous soap solution and cream solution respectively with a concentration of one per cent (w/v) (Chauhan et al., 2020; Umar, 2002).

. The electrode of the pH meter was then inserted into the solutions respectively (Idoko et al., 2018). The stages were replicated for each soap and cream sample, including the commercial soap utilized as a standard.

#### *Soap Reaction with Hard Water*

Two beakers were used for this study. Each of the beakers contains dissolved 1g and 8g of Ca (HCO<sub>3</sub>)<sub>2</sub> and 1L of distilled water. They served as the hard water for the experiment. In 100 ml beakers, 80 ml of two different hardness levels of water was measured. Confirmation of changes was noted through the breaking down of all the soap bars prepared from dried and roasted *T. catappa* kernel oil in low and high hard water concentrations.

*Soap Solubility Test:*

80 millilitres of tap water were chilled to 7°C. The water was poured into 100-millilitre beakers and the solubility of the soap was also established. This was achieved through the use of 0.2g of soap samples. They were poured into beakers for confirmation.

*Soap Flame Test*

A small quantity of the soap produced with oven-dried and roasted *T. catappa* seed oil respectively was extracted. The flame colour of each soap was checked after they were burnt (Shahinuzzaman et al., 2016).

*Soap Foaming (lathering) Ability Tests*

10 millilitres (10ml) of distilled water were poured into a 100-millilitres measuring cylinder. Then 0.2 grams of each soap sample were added to the respective cylinder. The liquid was agitated rapidly for 2 minutes to create foams, after which the cylinder rested for around 10 minutes, during which time the height of the foam was measured and recorded (Mabrouk, 2005; Warra et al., 2010). These steps were performed on both soaps produced with oven-dried and roasted *T. catappa* kernel oil.

*Moisture Content:*

Official method 981.11 of AOAC was applied to dry 10g of the sample to a constant weight at 105°C. The purpose is to confirm the moisture content of the oil (AOAC, 2000). After the substance had dried, the samples of the soap were weighed again.

The formula below was used to compute the percentage of the moisture content.

$W1 / W2$  equals 100% moisture content.

where W2 is the weight of the soap before drying and W1 is the weight of the soap after drying.

*Determination of Thermal Stability and Dermatological Safety Test of Cream:*

For determination of the thermal stability of body cream produced with oven-dried and roasted *T. catappa* seeds oil respectively, six glass tubes with a diameter of 15 mm and a height of 150 mm were taken, and they were filled with 2/3 the volume of the subjected samples and placed in the thermostat TC-80M-2 at 40–42°C for 24 h. If the formation of an aqueous phase was not observed in any glass tube, the bases were considered stable (Satisfactory) (Strus et al., 2018).

*Determination of Cream Behaviour at Storage:* A closed container of the sample was kept in an oven at 40°C for 6 weeks. Alternatively, a closed sample container was kept in the humidity chamber at 60 to 70% relative humidity. The cream was observed, and it passed the storage test if no oil separation at the end of the examination period (NIS 681-2010 Appendix A).

*Determination of dermatological Safety test:* twenty volunteers (human subjects) were subjected to the patch skin. Patches that can fit on the skin with the two varieties of body cream produced with *T. catappa* seed oil applied on the patch were suitably cut and left attached on each volunteer initially for 1-3 days, then removed and the skin area was observed for immediate reaction if there is no adverse reaction is observed, the skin is re-examined after 7 days and on the 8<sup>th</sup> day the patches are reapplied and examined as described above. The product passes if the product has no adverse reaction to the skin (NIS 681:2010 Appendix k).

*Total Fatty Matter (TFM):*

The method described by (Mak-Mensah et al., 2011) was used. The total fatty matter test was carried out by reacting the soap with acid in the presence of hot water and measuring the fatty acids obtained. 10g of soap produced with extracted oven-dried and roasted *T. catappa* seed oil respectively were weighed and 150 distilled water was added and then heated. The soap was dissolved in 20mL of 15% H<sub>2</sub>SO<sub>4</sub> while heating until a clear solution was obtained. Fatty acids on the surface of the resulting solution were solidified by adding 7g of bee wax and reheated. The setup was allowed to cool to form a cake which was removed and blotted to dryness and the total fatty matter was obtained as follows.

$$\%TFM = \frac{(A-X) \times 100}{W}$$

where; A = weight of wax + oil.

X = weight of wax.

W = weight of soap.

The standard total fatty matter of soaps is 76%(Abba et al., 2021).

*Matter Insoluble in Alcohol:*

Five grams of each soap sample were dissolved in 50 ml of hot ethanol and quantitatively transferred in a pre-weighed filter paper. The residue was dried in the oven at 105°C for 30 minutes, cooled, and weighed again then a reading was taken. The calculation of matter insoluble in alcohol (MIA) was carried out using

$$MIA = (W_s - FP) * 100 / W$$

where: W<sub>s</sub> is the Weight of the sample + filter paper, FP is the Weight of filter paper and W is the Weight of the sample. If the MIA value is high then it means the soap contains a high level of impurities (Idoko et al., 2018).

*Total Alkali:*

The total alkali was determined by titrating excess acid contained in the aqueous phase with standard volumetric NaOH solution. 10 g of the finished soap was weighed and 100mL of neutralized alcohol was added to it, then 5mL of 1 N H<sub>2</sub>SO<sub>4</sub> solution was added to the mixture and heated till the soap sample dissolved. The test solution was titrated against 1N NaOH using phenolphthalein as an indicator. The total alkali was obtained using the formula.

$$\%Total\ alkali = \frac{VA - VB \times 3.1}{W}$$

Where; V<sub>A</sub> = Volume of acid.

V<sub>B</sub> = Volume of base.

W = weight of soap.

3.1 = milliequivalent of Na<sub>2</sub>O

Good quality soaps must have no more than 5% alkali content (Idoko et al., 2018).

*Free Caustic Alkali:*

A method prescribed by (Milwidsky et al., 1982) and modified by (Mak-Mensah et al., 2011) was used. 5g of the

finished soap was weighed and dissolved in 30 mL of ethanol. A few drops of phenolphthalein indicator were added and 10ml of 20% BaC<sub>12</sub> was also added. The resulting solution was titrated against 0.05M H<sub>2</sub>SO<sub>4</sub>. Free caustic alkali was calculated as follows;

$$\text{NaOH} = \frac{3.1 \times V_A}{W}$$

where; V<sub>A</sub> = Volume of acid.

W = weight of soap.

3.1 = milliequivalent of Na<sub>2</sub>O.

The free caustic alkali must not exceed a value of 5%(Idoko et al., 2018).

*Specific gravity:*

100 ml of water and body cream produced with oven-dried and roasted *T. catappa* seed oil respectively were measured into different beakers using a weighing balance. The weight of the weight of the respective body cream was then divided by the weight of water(Ritonga et al., 2020).

### Statistical Analysis

A statistical package for social science SPSS version 25.0 was used. All experiments were performed in triplicate and the results were expressed as mean ± SD (standard deviation). Statistical comparisons were performed using an Independent- Samples T -Test. Differences were considered significant at (p<0.05).

## Results

Table 1: Physicochemical Properties of Dried and Roasted *T. catappa* kernels oils

Oil Parameters	Dried <i>T. catappa</i> kernel oil	Roasted <i>T. catappa</i> kernels oil	Prescribed/Expected
Appearance (Sensory)	Light yellow liquid	Light yellow liquid	
Odour (Sensory)	Characteristic of product	Characteristic of product	Characteristic of product
Moisture & Volatile matter (%)	0.09±0.00 <sup>a</sup>	0.06±0.00 <sup>a</sup>	0.10 (maximum)
Viscosity@28.5°C (cps)	55.00±0.00 <sup>a</sup>	55.00±0.00 <sup>a</sup>	
Specific Gravity@ 25°C (Gravimetric)	0.92±0.00 <sup>a</sup>	0.91±0.00 <sup>a</sup>	0.910-0.920
Refractive Index	1.46±0.00 <sup>a</sup>	1.46±0.00 <sup>a</sup>	
Flash Point (°C)	>200	>200	
Free Fatty Acid (%)	0.06±0.00 <sup>a</sup>	0.54±0.00 <sup>b</sup>	2.0 (maximum)
Acid Value (mgKOH/g)	0.11±0.01 <sup>a</sup>	1.07±0.01 <sup>b</sup>	4.0 (maximum)
Iodine Value (g/100g)	93.59±0.01 <sup>b</sup>	93.33±0.04 <sup>a</sup>	92-106
Peroxide Value (mEq/kg)	9.17±0.01 <sup>b</sup>	9.38±0.01 <sup>a</sup>	10.0 (maximum)
Rancidity	Negative	Negative	Positive/ Negative
Saponification Value (mgKOH/g)	195.02±0.81 <sup>b</sup>	190.26±0.09 <sup>a</sup>	188-200
Unsaponifiable Matter (g/kg)	0.78±0.02 <sup>b</sup>	0.50±0.03 <sup>a</sup>	0.90 (maximum)
Slip Melting Point (°C)	49.00±0.00 <sup>a</sup>	49.30±0.00 <sup>a</sup>	
Smoke Point (°C)	172.00±0.00 <sup>a</sup>	170.00±0.00 <sup>a</sup>	

Values are means of triplicate determinations with standard deviation of mean. <sup>a,b</sup>Values with different superscripts are significantly different at  $p < 0.05$

Table 1 Showed the physicochemical properties of dried and roasted *T. catappa* kernels oils. Dried *T. catappa* kernel oil had significantly higher Iodine, Peroxide, Saponification and Unsaponifiable Matter Values but lower Free Fatty Acid value ( $p < 0.05$ ) compared to the Roasted kernel oil. The values of other parameters were not significantly different. However, values of all the physicochemical parameters for both oils were within the stipulated National Industrial Standards specifications for edible oil.

**Table 2: Fatty Acid Composition of Oven dried and Roasted *T. catappa* kernel oil**

<b>Fatty Acid Composition</b>	<b>Oven Dried <i>T. catappa</i> kernel oil (%)</b>	<b>Roasted <i>T. catappa</i> kernel oil (%)</b>
<b><i>Saturated Fatty acids</i></b>		
C6:0	0.029	0.138
C12:0	<0.001	<0.001
C16:0	1.028	0.714
C17:0	<0.001	10.260
C18:0	0.142	0.106
C20:0	51.518	2.216
C22:0	<0.001	<0.001
C23:0	<0.001	<0.001
C24:0	0.324	<0.001
<b>∑SFA</b>	<b>53.041</b>	<b>13.434</b>
<b><i>Monounsaturated Fatty acids</i></b>		
C14:1 Cis-9	<0.001	<0.001
C15:1 Cis:10	<0.001	<0.001
C16:1 Cis-9	<0.001	9.954
C17:1 Cis-10	0.013	<0.001
C18:1 Trans-9	<0.001	<0.001
C18:1 Cis-9	<0.001	50.811
C20:1 Cis-11	26.008	9.830
C22:1 Cis-13	<0.001	<0.001
C24:1 Cis-15	3.698	<0.001
<b>∑MUFA</b>	<b>29.719</b>	<b>70.595</b>
<b><i>Polyunsaturated Fatty acids</i></b>		
C18:2 Trans-9,12	<0.001	<0.001
C18:2n-6 Cis-9,12	12.238	13.198
C18:3 Cis-9,12	<0.001	1.654
C18:3 Cis-9,12,15	2.163	<0.001
C20:3 Cis-8,11,14	0.097	<0.001
C20:3 Cis-11,14,17	0.178	0.121
C20:4 Cis-5,8,11,14	<0.001	<0.001
C22:2 Cis-13,16	0.012	0
C24: Cis-4,7,10,13,16,19	0.051	<0.001
<b>∑PUFA</b>	<b>14.739</b>	<b>14.973</b>



As shown in Table 2, oven-dried *T. catappa* seed oil contained more saturated fatty acids (SFA) > Mono unsaturated fatty acid (MUFA) > Poly unsaturated fatty acid (PUFA). Arachidic acid (C20:0) was present in the highest concentration (51.52%), followed by Godonic acid (C20:1) (26.01%), then Linoleic acid (C18:2 Cis 9,12) (12.24%). Roasted *T. catappa* seed oil contained majorly MUFA (70.60%) > PUFA (14.97%) > SFA (13.43%). Oleic acid (C18:1 Cis-9) was present in the highest concentration, followed by Linoleic acid (C18:2n-6 Cis-9,12) (13.20%) and margaric acid (C17:0) (10.26%).

**Table 3: Quality Parameters of Body Cream Produced with Dried and Roasted *T. catappa* kernels oil.**

Parameters	Oven-dried <i>T. catappa</i> kernels oil	Roasted <i>T. catappa</i> kernels oil	Prescribed/Expected NIS 681:2010
Appearance	Creamy semi -solid cream	Creamy semi -solid cream	
Specific Gravity	0.91±0.00 <sup>a</sup>	0.95±0.00 <sup>a</sup>	0.8-1.0
pH (10% Suspension)	7.30±0.01 <sup>b</sup>	7.01±0.02 <sup>a</sup>	5.0-8.0
Total Fatty Substance (%)	67.76±0.11 <sup>a</sup>	72.07±0.04 <sup>b</sup>	
Non-Volatile Matter (%)	89.53±0.00 <sup>a</sup>	88.75±0.00 <sup>a</sup>	
Water Content (%)	10.47±0.00 <sup>a</sup>	11.25±0.00 <sup>a</sup>	
Oil Content (%)	67.76±0.11 <sup>a</sup>	72.07±0.00 <sup>b</sup>	
Thermal Stability	Satisfactory	Satisfactory	Satisfactory/Failed
Rancidity	Negative	Negative	Negative/Positive
Dermatological Safety Test	Satisfactory	Satisfactory	

Values are mean ± Standard deviation, n = 3. <sup>a,b</sup>Values with different superscripts are significantly different at p<0.05

Quality parameters of body cream produced with dried and roasted *T. catappa* kernel oil (Table 3) showed that the body cream produced with Oven-dried *T. catappa* kernel oil had a significantly higher pH than the product from Roasted *T. catappa* oil (p<0.05). Values of total fatty matter and oil content of the oven-dried *T. catappa* seed oil product were significantly lower. There was no significant difference in specific gravity, non-volatile matter, and water content of both products. Similarly, the parameters determined were all within the specified Industrial Standard range.

**Table 4: Quality Properties of Soap Produced with *T. catappa* kernel oil**

Parameters	Oven-dried <i>T. catappa</i> kernels oil	Roasted <i>T. catappa</i> kernels oil	Expected/ Prescribed NISARS-490-2:2019
Appearance	Creamy solid bar	Creamy solid bar	
pH (1% Solution)	9.28±0.25 <sup>a</sup>	9.49±0.01 <sup>b</sup>	
Total Fatty Matter (%)	67.56±0.17 <sup>a</sup>	72.82±0.01 <sup>b</sup>	62.0%(minimum)
Matter Insoluble in Ethanol (Gravimetric) (%)	1.97±0.10 <sup>b</sup>	1.92±0.02 <sup>a</sup>	2.5%(maximum)
Free Caustic Alkali (as NaOH) (Titrimetric) (%)	<0.00 <sup>a</sup>	<0.00 <sup>a</sup>	0.1%(maximum)
Total Free Alkali (as NaOH) (Titrimetric) (%)	<0.00 <sup>a</sup>	<0.00 <sup>a</sup>	0.2%(maximum)
Unsaponifiable fatty matter (Titrimetric) (%)	0.18±0.01 <sup>b</sup>	0.13±0.01 <sup>a</sup>	0.2%(maximum)
Moisture & Volatile matter 105°C (%)	19.46±0.09 <sup>b</sup>	15.96±0.17 <sup>a</sup>	30.0%(maximum)
Chloride Content (as NaCl) (Titrimetric) (%)	0.20±0.01 <sup>a</sup>	0.23±0.00 <sup>a</sup>	1.5%(maximum)
Lather Volume(millilitre)	210.00±1.00 <sup>b</sup>	205.00±1.00 <sup>a</sup>	
Staining ability	Passes	Passes	Shall pass the test

Values are mean ± Standard deviation, n = 3. <sup>a,b</sup>Values with different superscripts are significantly different at p<0.05

The result in Table 4 showed a significantly lower pH and total fatty matter in the oven-dried *T. catappa* oil-based soap compared to the roasted oil product (p<0.05). On the other hand, values of Matter Insoluble in Ethanol, Unsaponifiable fatty matter, Moisture & Volatile matter as well as Lather Volume of the oven-dried based products were significantly higher than those of the roasted kernel-based products (p<0.05). There was no significant difference in the Free Caustic Alkali, Total Free Alkali, and chloride content of bar soap produced with oven-dried and roasted *T. catappa* seed oil. All parameters analyzed also had values within the specified range.

## Discussion

The physical and chemical properties of a substance are indirectly a reflection of its quality. The commercial significance of oils depends mostly on these physiochemical properties which provide baseline data to determine their suitability for consumption (Bamgboye et al., 2010; McCarthy et al., 2009; Parthiban et al., 2011).

*Terminalia catappa* seed oil extracted in this study was a light-yellow liquid, and this suggested the presence of more yellow pigments (carotenoids). These carotenoids are beneficial since they stimulate the appearance of lipids without the use of primary colourants such as carotenes, annatto, and apo-carotenals commonly used in the oil and fat industry (Nehdi et al., 2010).

The percentage of oil yield in this study is 53.22% for oven-dried and 45.05% for roasted *T. catappa* seed oil respectively. Previous studies have reported between 35 and 59 per cent of a light-yellow oil that is edible and identical to true almond oil (*Prunus amygdalus*) produced when the *T. catappa* fruit kernel is sun-dried; however, the oil becomes turbid when left to stand (Adu et al., 2015; Adu et al., 2013; Howes, 1948; Orhevba et al., 2016)

Free fatty acids are most likely formed by the hydrolytic activity of lipolytic enzymes during the preparation of seeds for oil production. It can act as a pro-oxidant in oils by speeding up the rate of hydroperoxide decomposition. The more free fatty acid (FFA) an oil contains, the quicker it will break down and start smoking (Satyarthi et al., 2013). Thus, high FFA content in the oil may cause further oxidation and lead to the development of an offensive taste and flavour in the oil. Oils with low free fatty acid levels would possess, according to this point, a proven nutritional quality for consumption. The oil extracted has a free fatty acid content of 0.06% and 0.54% in the oven-dried and roasted seeds respectively, which is less than the maximum 2.0% acceptance value. The values are less than those obtained for the oils of *Chrysophyllum albidum* (African star Apple) 2.78% for *Dacryodes Edulis* (African plum), 7.06% for *Elaeis guineensis* (African oil palm), 7.70% for *Landolphia owariensis* (white Rubber Plant), and 2.60% for *Napoleonaea Imperialis* (Napoleon hat) (Akubugwo et al., 2007).

The acid value of oil is dependent on the amount of free fatty acids present or the degree of hydrolysis of the oil. The acid value of oil suitable for edible purposes should not exceed 4 mgKOH/g (Esuoso et al., 1995). The acid value of (0.11 mgKOH/g oil) and (1.07 mgKOH/g oil) for the dried and roasted *T. catappa* seed oil shows a comparatively low value due to its low content of free fatty acid, and it confirmed their suitability for consumption.

The iodine value for the extracted dried and roasted *T. catappa* seed oil in this study was (93.59, 93.33 wjjs) which is, 93.59 g/100 g of oil and 93.33 g/100 g of oil respectively. The iodine value is higher than typical iodine values obtained for coconut oil (25-40g/100g), and palm oil (37-54g/100g), but in the same range as that of olive oil (75-95g/100g) and peanut oil (85-100g/100g). The iodine value of this study is in sharp contrast to the value obtained (65g/100g) by Olatidoye et al. (2011) (Olatidoye et al., 2011) for the Indian almond nut oil collected in Nigeria which classified the oil as a non-drying oil. The acceptable international standard value set by the Codex Alimentarius Commission for the iodine value of seed oil suitable for consumption is between 92-106 g/100 g of oil.

Peroxide value is a measure of the reaction rate of lipid oxidation, which causes rancidity. Normally, oils become rancid when the peroxide value ranges from 20.0 mg/g oil to 40.0 mg/g oil (Babalola et al., 2011). The peroxide value of dried *T. catappa* seed oil (9.17 mEq/kg) was significantly lower than the roasted *T. catappa* seed oil (9.383 mEq/kg); however, the peroxide values of both oils are below the maximum acceptable value of 10 mEq KOH/kg set by the Codex Alimentarius Commission for oil seeds (Codex et al., 2001). Hence the oil of *Terminalia catappa* seeds is edible and nutritive properties cannot be destroyed during storage.

The rancidity indices derived from this study were negative for both dried and roasted *T. catappa* seeds oil, which collaborates with the peroxide value. The saponification value is inversely proportional to the mean molecular weight of the fatty acid in the glyceride present in the lipid. Saponification is a measure of oxidation during storage and also indicates deterioration of the oils (Neagu et al., 2013). The high values of saponification

of this study (195.02, 190.26 mgKOH/g), indicated the presence of many fatty acids of low molecular weight, making possible the proposed utilization of these oils in soaps and cosmetics industry. The saponification values of dried and roasted *T. catappa* seed oil were comparable to that of sunflower, and corn oil, which have average saponification numbers ranging between 191 mg KOH/g oil and 250 mg KOH/g oil (Babalola et al., 2011). However, the dried and roasted *T. catappa* seed oil showed a low unsaponifiable matter. Unsaponifiable matter includes higher aliphatic alcohols, sterols, pigments, and hydrocarbons. These are substances frequently found dissolved in fatty acids. The unsaponification matters of this investigation were 0.78g/kg and 0.50g/kg for dried and roasted *T. catappa* seed oil respectively. The results indicated that acid, free fatty acid, and the saponification values of dried and roasted *T. catappa* seed oil were within acceptable levels based on the standard for edible oils.

Specific gravity is the heaviness of a substance compared to that of water, and it is expressed without units. The specific gravity obtained for all the oil samples (0.92, 0.91) is less than 1.0 when measured at 25°C. These values are less than that reported for *racemosa* seed oil (4.95) by Amoo et al. (2008), but the values of both almond oil compared well with that reported for cotton seed (0.92), coconut oil and sunflower seed (Barku et al., 2012). In consideration of the value of this study, the dried and roasted *T. catappa* seed oil is less dense than water.

The refractive index is an important characteristic that determines the degree of saturation or unsaturation of fat and oils. The mean refractive indices of 1.464 and 1.463 were obtained from the oil samples derived from dried and roasted almond seed respectively at the temperature of 25 °C. The value of the studied oil also indicates that the oil is less thick when compared with most drying oils whose refractive indices are between 1.475 and 1.485 (Olatidoye et al., 2011).

The fatty acid composition of oil is its most useful chemical feature. Many of the chemical tests for oil identity or purity can be related to the fatty acid content of the oil (Ajayi et al., 2009). (Ajayi et al., 2008) reported a higher concentration of unsaturated fatty acids in *T. catappa* oil. In this study, oven-dried *T. catappa* seed oil has a higher percentage of saturated fatty acids while roasted *T. catappa* seed oil was majorly unsaturated fatty acids. Studies have demonstrated that MUFA are better contributors to plasma cholesterol-lowering effects than saturated fatty acids (Ajayi et al., 2008). The presence of monounsaturated fatty acid can counteract the effect of the saturated fatty acid and the seed oil can be of nutritional benefit. The high linoleic acid content of the seed oils is significant since linoleic acid is undoubtedly one of the most important polyunsaturated fatty acids in human food due to its prevention of distinct cardiovascular disease. Cardiovascular disorders such as coronary heart disease, atherosclerosis, and high blood pressure are prevented by dietary fats rich in linoleic acid (Dagne et al., 1997; Vles et al., 1989). In comparison to other vegetable oils for consumption, like palm, soybean, sesame, olive, and coconut oils (Ladele et al., 2016), *T. catappa* seeds contain 1.2:1.1:1 equilibrium of fatty acid, MUFA: PUFA, which has been discovered to comply with the directive of the American Heart Association (AHA) and National Cholesterol Education Programme (NCEP) (Alemayhu et al., 2019) regarding fat in nutrition. NCEP and AHA have a guideline on the appropriate quantity of fatty acid in nutritional oil (Kaur and Myrie, 2020). However, it is very difficult to get such oils. These findings just suggest that there is a strong likelihood that *Terminalia catappa* kernel oil could be used to resolve this dilemma.

The physicochemical analysis of the Body cream produced in this study was its pH (7.30, 7.01), total fatty matter (67.76, 72.07), specific gravity (0.908, 0.948), water content (10.470, 11.250), oil content and non-volatile matter for both oven dried and roasted *T. catappa* seeds oil respectively. The pH value of body cream is an indicator of its level of alkalinity or acidity, The pH of the skin surface has repeatedly been shown to be acidic, varying from pH 4 to 6, depending on the anatomical site of the body (Dikstein et al., 1994; Rippke et al., 2002; Zlotogorski, 1987). Several moisturizing creams with worldwide acceptance among people with dry skin have pH values of about 7–8 (Buraczewska et al., 2005), the acceptable pH range for body cream and lotion by Nigeria industrial standard is between pH 5.0-8.0. Thermal stability is the ability of a compound to resist decomposing when heated, a molecule with more stability has more resistance to decomposition at high temperatures (Alvin et al., 2019; Kwak et al., 2015). The thermal stability results of creams produced in this study were satisfactory. The dermatological safety test gives a satisfactory result, which is an indicator that the products are safe to use and can not cause any harm to the skin. This test determines the safety of products from contaminants that could be harmful or cause damage to the skin (Iwegbue et al., 2015). All the parameters' values derived from both varieties of *T. catappa* seeds oil is within the Nigeria industrial Standard acceptance ranges.

The pH values of the Bar soap produced in this study were 9.28 and 9.49 for both oven-dried and roasted *T. catappa* respectively, comparably within the higher pH range of 9-11 set by the National Agency for Food and Drug Administration and Control (NAFDAC). Handmade soap is always alkaline with a safe range pH between 8-10 to use on the skin (Umar, 2002). Any soap above pH 11 will be too harsh for the skin and below pH 8 is not advised to be used on the skin, because it is an indicator that it has no more cleansing power and may result in skin damage (skin peeling). The pH results of this study are similar to the pH 9.50 of Lifebuoy soap (Commercial soap). The total alkali and free caustic content of *T. catappa* oil was <0.0001. Free caustic alkali is one of the parameters that determine the abrasiveness of any given soap. The determination of percentage chloride levels in soap is important as excess amount causes soaps to crack. The % Cl<sup>-</sup> value (0.20% and 0.23%) reported in this study for dried and roasted oil respectively was less than that obtained (0.90%) from neem oil soap by (Taiwo et al., 2008) and lower than the standard maximum value of 1.5%. This indicates that the value obtained is enough to sustain soap and prevent it from cracking. Total fatty matter (TFM) is how much fat substance the soap has, which is an indicator of soap quality. The more it has, the better the quality of the soap. TFM of 67.56% and 72.82% for dried and roasted oil respectively, are similar to those obtained (65-70%) by (Mak-Mensah et al., 2011) and (Taiwo et al., 2008).

The health benefits of *T. catappa* seed oil such as its moisturizing effects, due to its being rich in vitamin E may be especially helpful for people who have dry or sensitive skin (Sumit et al., 2012). Animal studies have shown that when applied to the skin, vitamin E may help protect cells from sun damage and premature aging (Gyawali et al., 2022). The favorable physicochemical characteristics of the body cream and soap produced with oven-dried and roasted *T. catappa* seeds oil respectively suggest their suitability as raw materials in soap and cosmetics industries.

## Conclusion

*Terminalia catappa* seed is an oil-rich seed. The roasted seed oil is richer in unsaturated fatty acid compared to

the oven-dried seed oil. The physicochemical analyses of the oil indicate its potential for utilization as raw material in the food and cosmetics industries, and its application in body cream and bar soap formulation revealed high-quality products that meet industrial standards specifications. This confirms that this underutilized plant has huge industrial potential that can contribute significantly to the nation's economic growth.

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## SESSION FOUR: FOCUS ON PEACE (SDG 16)

### 1. When Buildings Speak: Socio-Cultural: Values of Dwellings Among The Settled Fulani Of Oke-Ogun, Oyo State

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#### Abstract

The discourse of nomadism and its attendant sociocultural implications is a central theme in the ethnography of the Fulani. Existing anthropological studies have focused on the socio-economy of cattle herding and settlement patterns, devoting little or no attention to the ecological and cultural significance of the unique architecture of the Fulani homesteads. This study was, therefore, designed to investigate the adaptiveness of the homesteads of Fulani settlers, to determine the roles that stable and sedentary lifestyles play in the evolution of their architecture. Acculturation Theory was adopted as the framework, while ethnographic design was used. Tede, Shaki, and Iseyin in the Oke-Ogun area in Oyo State were purposively selected for the study because of its large population of Fulani settlers. Qualitative data was obtained through participant observation, thirteen key informant interviews conducted with elderly Fulani in the selected communities, three Focus Group Discussion sessions with young men, and In-depth interviews with forty-one residents selected through convenience or accidental sampling. Data was analysed using the ethnographic description. There is evidence of an acculturation process going on among the settled Fulani in Oke-Ogun, which suggests that Fulani are amenable to changes within their eco-cultural system. These changes are responses to local climatic conditions and the influence of the gradual assimilation of Oke-Ogun culture. The design of their new architecture will be of value to cultural interchange in Nigeria.

**Keywords:** Settled Fulani, Oke Ogun, Eco-cultural values, Dwellings.

#### Introduction

Anthropological and historical research has given differing opinions on how architectural patterns or “house designs” are in direct influence of culture. In the research conducted by Oliver (1986) on housing in Turkey, he realised housing designs are influenced primarily by family. Privacy and protection of women from men was an important family value recognised by many households and largely under the influence of religious beliefs. Cultural values as defined by Lawrence (1987) is the set of moral and aesthetic principles that give an idealized framework of what the world should be. Lawrence's research in Australia on the German settlements gives the ideology that aside from cultural beliefs, political and social events shape housing designs and forms taken by the Germans. Different explanations exist on how culture influences housing designs, linking cultural values to house designs. Because the cultural values of the Fulani in Oke-Ogun have gone through modifications, the influence of acculturation can be assessed adequately by understanding the initial culture of the Fulani occupants and their culture compared to the culture of the host community.

One can only understand cultural values, human lifestyles and activities in their unalloyed state if these phenomena are studied in a traditional environment (Rapoport, 1969). Traditional house designs as defined by Rapoport take many shapes from generation to generation and that it is as a result of certain complex collaborations between architects or house builders and house users. There has been a shared traditional value among these sets of people for many generations. The shared sense of a shared cultural value and adherence to these values stands as a form of control enhancing moral discipline from generation to generation. These shared values encouraged a shared image of life and living and this has a strong influence in the kinds of houses built. Folk tradition takes its expressive forms in this regard. It takes into consideration from generation to generation the values, desires, dreams, needs and passions of the people (Rapoport, 1969).

The styles, patterns and placement of buildings among Fulani and their neighbours are a result of certain socially constructed shared meanings and beliefs. For instance, the choice of material, construction style, technology and environment will provide completely different building patterns. Architectural designs of sedentary or semi-sedentary Fulani settlement patterns are a mixture of multi-dimensional factors, notably eco-cultural factors. Cultural forces however are the primary determinants of architectural designs, other factors simply stand secondary and are thus tagged modifying factors. Such secondary factors are factors considered in climatic, available resources and prevailing technologies. All these factors are important, but none is as primary and more important as the cultural factor. This is a world-reckoned force. Value systems are a strong factor in housing form determinants. People have differing reactions to goods and services and this is arguably due to their differing cultural values (Rapoport, 2005). Values can be studied and they are often enmeshed in imaginary images (Rapoport, 1997); these images sometimes are visible in certain lifestyles. Often one can judge people from the way they behave, and these peculiar behaviours can be linked to their ancestral cultural backgrounds. It is a strong point and determinant of choices people make, how they behave and the way they allocate resources (Rapoport, 1980). People's lifestyles are strongly influenced by the environment in which they grow. Summarily, it is strongly established that the bond between culture and forms of architectural designs goes beyond the observation of structures to include processes instituted and driven by the inherent values of a cultural group. Primarily, this study aims to examine the sociocultural values in the architectural designs of Fulani buildings in Oke-Ogun, Nigeria

### **Statement of the Problem**

Conflicts have arisen between settled Fulani and host communities across Nigeria, leading to violence, displacement, and insecurity. These conflicts often stem from cattle grazing on farmland, creating tensions with both subsistence and commercial farmers. This escalating problem poses a significant security challenge for the Nigerian government and has prompted increased attention to the implications of Fulani-host community conflicts. However, there has been little assessment of the touristic potential of the eco-cultural values reflected in the architectural designs of Fulani homesteads, particularly in Oke-Ogun, where a large number of acculturated Fulani reside.

This study aims to address this gap by emphasizing the identity of the Fulani within an eco-cultural context as a key determinant of their homestead architectural designs. While there has been considerable research on the settled and semi-settled Fulani, discussions have often overlooked the potential for economic benefits and cultural preservation among sedentary Fulani in the Oke-Ogun region, where we have the acculturated Fulani in

large numbers.

### **Literature Review and Theoretical Learning.**

Studies, like those by Tonah (2006), Ofuoke and Isife (2009), and Muhammed, Ismaila, and Bibi (2015) have assessed the economic and humanitarian cost of Fulani-Host community conflicts which range from gross depletion in the overall outputs of farmers and then a reduction in income to loss of lives or properties but placed little emphasis on touristic potentials of the architectural designs of the sedentary Fulani settlement.

The styles, patterns and placement of buildings among Fulani and their neighbours are a result of certain socially constructed shared meanings and beliefs. For instance, the choice of material, construction style, technology and environment will provide completely different building patterns. Architectural designs of sedentary or semi-sedentary Fulani settlement patterns are a mixture of multi-dimensional factors, notably eco-cultural factors. Cultural forces however are the primary determinants of architectural designs, other factors simply stand secondary and are thus tagged modifying factors. Such secondary factors are factors considered in climatic, available resources and prevailing technologies. All these factors are important, but none is as primary and more important as the cultural factor. This is a world-reckoned force. Value systems are a strong factor in housing form determinants. People have differing reactions to goods and services, and this is arguably due to their differing cultural values (Rapoport, 2005). Values can be studied, and they are often enmeshed in imaginary images (Rapoport, 1997); these images sometimes are visible in certain lifestyles. Often one can judge people from the way they behave, and these peculiar behaviours can be linked to their ancestral cultural backgrounds. It is a strong point and determinant of choices people make, how they behave and the way they allocate resources (Rapoport, 1980). People's lifestyles are strongly influenced by the environment in which they grow. Summarily, it is strongly established that the bond between culture and forms of architectural designs goes beyond the observation of structures to include processes instituted and driven by the inherent values of a cultural group.

The gap in researchers' interest in the determinants of the architectural designs of the Fulani homesteads and settlement patterns has led to the present inquiry. There has been very limited analytical work in this area, although significant research has been conducted on the cultural values of the Fulani. However, the publications that have appeared in West African countries and some parts of Nigeria exclude the experiences of Fulani in Oke-Ogun, Oyo State, and the sociocultural values of their architectural designs.

The study thus raises consciousness, beyond issues of generalisation of Fulani as the aggressive lots, to showcasing the sociocultural values as potential yardsticks in understanding them and possible avenues of harnessing other contributions they can give to their host communities beyond the violent confrontations and clashes they often have with host farmers in most parts of Nigeria. They have clashed with the people of Oke-Ogun including Kisi, Igangan and Saki more than any other sub-ethnic group of the Yoruba nation. However, the touristic potential of their architectural and settlement pattern in Oke-Ogun is immense and needs to be acknowledged in scholarship.

This study is also significant in the sense that it heightens awareness about the lack of identity kit in the location of settlement patterns, emphasizing the need to look beyond the inherent traditions of a place. Architects and policymakers should be more concerned with the demands of the house users and not alone focused on the

traditional beliefs of the land. All designs are to be strictly about what will support the livelihood and activities of the house user.

Tede became more attractive for the study after taking into consideration the cluster of Fulani communities in the Atisbo local government. The physical presence of the homesteads of the people under study was a major factor in the choice of Tede as the primary site of study. Tede has a Fulani community with unique architecture. The work focused on the structures of the buildings, the significance of the buildings and the materials used. We then checked with other Acculturated Settled (AS) Fulani communities around Oyo state to see if there could be any similarities or differences.

The gap in researchers' interests in the determinants of the architectural designs of the Fulani settlement patterns has led to the present inquiry. There has been very limited analytical work in this area, although significant research has been conducted on the cultural values of the Fulani. However, the publications that have appeared in West African countries and some parts of Nigeria exclude the experiences of Fulani in Oke-Ogun, Oyo State, meanwhile, the Fulani buildings speak to us in all ways.

A consistent belief by anthropologists seems to be that acculturation is important in considering the behaviour and beliefs of members of ethnic groups in any multicultural society. Furthermore, a broad consensus among researchers is that individuals who are exposed to a different cultural context exhibit a “complex pattern of continuity and change in how they go about their lives” (Berry, 1997:6).

As a construct in the social and behavioural sciences, acculturation has an early history of benign neglect. The last 3 decades have nevertheless been characterized by a resurgence of interest in defining, measuring, and reconceptualising acculturation to understand its role in shaping people's attitudes, norms, values, and actions. Early interest in acculturation primarily began in the anthropological community, which set out to describe the nature and effects of contact among distinct cultural groups. Many anthropologists focused on defining and properly understanding the dynamic processes that occur when cultures interact.

Redfield, Linton, and Herskovits (1936) established one of the first classical definitions of acculturation-encompassing changes in original cultural patterns that occur as a result of ongoing contact among groups of individuals with different cultures. In 1954 the Social Science Research Council proposed an expanded definition by stating that acculturation is the merger of two or more independent cultural systems, leading to dynamic processes that include the adaptation of value systems and transformation within relationships and personality traits. This definition suggests assimilation is not necessarily the only outcome possible when cultures interact, and acculturation is a selective process that may cause changes in one area of human behaviour but not in another. Despite their long history, these initial conceptualizations of acculturation continue to influence our current thinking in the field.

Recently, researchers have been trying to develop more sophisticated acculturation measures and assess the impact or relationship of acculturation with a panoply of behaviours, beliefs, attitudes, and perceptions. Our understanding of acculturation in the psychological literature has increased significantly with the development of conceptual frameworks (e.g., Berry, 1990; Padilla, 1980), analyses of methodological constraints (e.g., Berry, Trimble, & Olmedo, 1986; Olmedo, 1979, and appearance of critical reviews of the literature (e.g., Berry & Sam, 1996; Ward, 1996).

As is true with significant portions of research on ethnic groups, many seminal publications dealing with

theoretical and empirical issues on acculturation appeared in difficult-to-find sources or ephemeral outlets. These circumstances produced a situation in which advances in the field sometimes went unrecognized and the significance of the construct was obscured. Studies (e.g., Berry & Sam, 1996; Ward, 1996) have helped to alleviate this problem, and this study is one more attempt to apply the theoretical grid of acculturation to actual life phenomena, this time the Fulani-Yoruba interaction as a basis for adaptations of architectural designs and patterns.

### **Methodology.**

#### **Sampling and Sample Size**

The study design was exploratory and involved the use of ethnography and intensive field work that lasted three years. The study adopted the use of Photographs (taken during fieldwork), observation, qualitative in-depth interviews, informal conversations, and focus group discussion.

The sampling population comprised the entire Fulani settlements in Atisbo Local Government, Oyo State, Nigeria. Members of the sample were selected through purposive and random sampling. Key informants and members of the focus groups were purposively selected from different categories of the populations, about their knowledge of the subject matter. The informants include the traditional rulers, chiefs, and Fulani in Awe, Saki, Isehin and Tede. The average number of minutes spent per informant was roughly thirty-five (35) minutes.

Informants for IDI's were selected through a simple random sampling technique at different places such as mosques, markets, streets and Fulani homesteads. However, criteria for inclusion include ethnicity, age, and willingness to participate in the study. In all, 70% of the informants were selected using simple random sampling methods, particularly for those included in the IDI's, while 30% of others were selected using purposive sampling methods of data collection.

#### **Architectural Forms of Fulani Dwellings in Oke-Ogun.**

The architecture is a manifestation of the cultural context of adaptation and adoption to the community. In Oke-Ogun, buildings are, in fact, matrices for social structure, and this corroborates the claim that:

Anthropologists believe that plastic arts, [including architecture], can be read to describe the "whole way of life" of a society. Encompassing much more than just the basic needs of a society, the architectural form responds to a far more complex system (Herskovits, M.J. 1965).

Architectural designs of the Fulani respond to a complex system. It is not just an expression of a way of life, but of a "whole way of life" of a society. Evident are characteristics of the land, the attributes of personality, the socio-economy of the community and a functional adaptation to the climate and culture. Each settlement reflects a need, the family structure and hierarchy, the roles of women, notions of privacy and valued social interaction. Among the traditional Yoruba in Oke-Ogun, the kitchen is one of the very few areas of the house that are the "woman's domain," and is specifically designed for her use in terms of the scale of the space and arrangement of



equipment. In a sense, the room becomes a cultural space because human concerns, in addition to functional requirements, are considered in its conception.

But in Fulani buildings, huts are for either sleeping, cooking or tethering animals, they are separate and cyclical arranged with a pointed roof. The purpose of a cyclical arrangement is to offer protection for the house from harsh climatic conditions such as wind. The grass used for construction keeps the building cool during the dry and cold seasons. They are tightly knitted to disallow rain from sipping through into the buildings, as well as guiding against reptiles and winds. A typical large household would have the household head's hut in the centre, while other buildings are constructed around it. The headship of the household that controls members of the household.

Besides the thatched huts, there are mud structures. Over time, due to the scarcity of grass for hut construction, the Fulani have adopted the use of mud for the construction of huts. The houses constructed with mud are of two types. The first type is the hut constructed with bricks made from mud. The mud is collected, processed and cast into moulds to get a particular shape. The second type of building is constructed with mud but not in brick shape. However, both huts have roofs made from grass. Each of the constructed huts has a door at the entrance and a small window at the back of the huts. The doors and windows are made small to control the cold hoarding of the house during the rainy season.

In the interview with Informant X3, a key informant, I asked if the houses are built in the same way in the North (of Nigeria). He answered, that, obviously it must be in the same way: southern Fulani build their houses because they migrated from the northern part of Nigeria and must maintain their identity. To an average Fulani, the real Fulani houses are built with grasses all through. The huts in their dwellings these days are a mixture of mud for the body and grass for the roofing. Their preference for all-through thatch huts is that one, the grass used to be available in large quantities, secondly, they are lightweight and can be picked up when the nomads or semi-sedentary Fulani need to move with their cattle in search of water. I saw some of the all-grass huts' constructions in many of their *igas*. And they expressed a great preference for such huts type that is traditional and indigenous to their race. The head of Iga Oniyere, an Islamic clergy believed Fulani in the part of Awe need to act more in ensuring that the Settled Fulani in Oyo generally do not get carried away with the hospitality of their host community (Yoruba).

“All-through grass huts are the best. Only we don't have grass in large quantities again. We must use the material available (mud), thatch the roof up and still retain our conical shapes. It is better than not having such buildings at all. Our children would easily forget they are Fulani”. (Personal Communication, 2017)

Even though many buildings are constructed of natural materials, particularly earth, buildings constructed out of natural materials are now rare and uncommonly seen around the world. Buildings constructed out of mud and other natural materials were until recently considered primitive. The images of Fulani mud houses display a certain peculiarity.

Of course, I sense the need for the Yoruba to also encourage the Fulani architectural designs in their *igas* to guide against land use conflict that is almost inevitable in the future. The Settled Fulani have started claiming equal ownership of the lands, which the Yoruba population have not started observing to the best of my observation. A commercial biker was pointing at many instances of how the Fulani have come to be regarded as factors in the

socio-economic life of the Oke-Ogun people. He was sympathetic towards the Settled Fulani as against their Bororo kinsmen who kept spoiling the farmlands of the Settled Fulani who he constantly referred to as “*FilaniIbile*” (native Fulani). He was however quick to point out the fears of allowing them too much space. “My sister, the *Filani* are too aggressive. We cannot forget the slaughtering of our people between the years 1999 and 2000”. But could they have been the ones killed in Saki considering the level of integration with your people? I asked. “Their brothers did. They keep relationship with their brothers in the bush. Those help them rear their cattle”. Despite the high level of seemingly cohesive coexistence between the Settled Fulani is mutual distrust on both sides. As the Yoruba in Oke-Ogun still cannot hold them to trust fully from the experience of ethnic clashes they had had with the neighbouring town of Saki, the Fulani also fear the total influence of Yoruba culture on theirs that could erase the Fulaniness in a few decades to come.

Another twist is that observed in Awe town. The family heads of three *igas* visited all expressed the unfairness of having to rebuy the land that had been ceded to them for over a century. That explained why they must build more of their huts to wade off an incursion into the remaining parts of the land. The Yoruba population were seen building very close to *iga* Baba Musa. This act to them is part of the reason for the unavailability of *fudoo* (grass).

### **Cultural Construction in the Values of Styles and Placements of Buildings in the Fulani Settlements.**

Cultural attitudes about privacy influence the Fulani architectural form; degrees of privacy within the society, views about personal self-worth; territoriality and sex all have an impact on the form of the built environment. The Fulani have an attitude about being bare, and their architecture tends to be less visually open to the public. A Fulani culture, with an emphasis on modesty, orient attitudes, to building a closed space. What the basic form of building requires is a closed space for a bath.

Fulani men and women have separate places for sleeping, even in marriage. Indeed, Informant X4 was very surprised to know that women and men should sleep in the same place in the first place. As he says:

“Yes, that is true, in the room men and women sleep separately, it is not an accepted tradition for men and women to live in the same room at a stage in their lives. He said it is not common for husbands and wives to sleep on the same bed. It is not something that the Fulani do”. It is a normative practice that is culturally interpreted among the Fulani.

(IDI, XT5, Male, 70 yrs, Tede 2017).

The researcher probed further; “including a husband and wife? Another informant, XA6 stated in another interview at Awe, that Fulani women sleep to the left of the house, “because it is a natural order for women to tie their wrappers to the left”. The researcher raised the question of nature that makes most humans right-handed because of the positioning of the brains. But that did not make much meaning to them. To them, modernity has come to rob people of everything that is “right”. Similarly, all the men in the group discussion at Tede agreed that the rightful position of a woman in the dwelling is the left-hand side. They think it is divinely arranged for a man to understand the use of space. Like every other spatial allocation such as markets and worship centers, the inner chamber of a dwelling has been divinely ordered and allocated by nature. A view which was captured by an informant in IDI, Awe in 2017. Even though this assertion is not logical to the researcher, it is part of their cultural disposition that women are better protected and secured in the left part of their dwelling.

“The left side will enable them to better conceal their nakedness, and because the men own the right side, women cannot take it from men. But unfortunately, the situation in our hands is that some women tie their wrapper to the right now, although it is still not common among the Fulani”.

(IDI, XA6, male, 65 yrs, Awe, 2017)

### **The Social Construction Inherent in the Styles of Fulani Architecture**

A typical large household has a structure for the household head in the center of the occupied space as depicted in plate 10. It is the biggest hut that is often sited in the center that is called *suudu*. Other buildings are constructed around it. The *suudu* serves as the focal point of any settlement (*gure*) because it represents the authority, power, and dominance of the male. Here, the father (*dafijo*), entertains his male visitors, from inside or outside his *suudu*. Political discussions with other heads of the clans are held in *suudus* around the community, signifying the importance that men play in making decisions for and on behalf of the community. The researcher asked informant XT9 if there is anywhere in this arrangement of houses that are out of bounds to women. That is, which is forbidden for women to reach? Informant XT9 said no, “there is no such place. Women can move anywhere around as they like here”. In the arrangement of the studied Fulani homesteads, it is common to build different types of huts, small ones are built all around and big ones at the centre. As informant X4 showed me around, he pointed at a *suudu*, the biggest hut situated closer to the second entrance to the settlement, and said:

“So, if we are talking about the northern ways of placement of buildings, and not the Yoruba influenced styles that we have around here, just as the Yoruba people do not build separate [or detached] buildings for the head of their family, the Fulani population settled in this area do not have much of the *suudus* built. But we need to start building *suudus* as this is our own unique household settlement arrangement. For instance, the Northern Fulani still practice *purdah*. They keep their wives in an enclosure commonly referred to as *bashiga*.

(IDI, XT9, Male, 60+ yrs, Tede, 2016)

What is *bashiga*?

*Bashiga* is the strictly barricaded area where the wives of a clan head stay. It is forbidden for any other man, apart from the husband, woman, or close male members of the family like father, father-in-law, brothers and sons to gain access to the area. It is always located at the end of the compound, according to Islamic injunction.

(KII, XA10, The head of Iga Oniyere, Male, Awe, 2017)

The two important buildings ongoing during the ethnographic visits a granary (*lumure*) and a *Suudu* were under construction. The first stage of the construction is the clearing of the site by the family members. The Second stage is the gathering of materials and heaping them close to the site, after which, as still the second stage, the clay soil for the moulding is dug out from the surface of their surrounding soil. The final, third stage is the construction proper. The basic materials needed are just (1). *Fudo* (generic term for grass), (2). *Bomboru* (clay), (3). *Kewi* (bamboo) (4). *Beere* (elephant grass; and the most preferred, but which is also scarce now) (4). *Bulude* (common grass). These materials are needed in constructing the Fulani huts. Nevertheless, due to the scarcity of

these materials, alternatives are being provided which caused the Oke-Ogun Fulani to adopt the use of new materials, natural or artificial. (FGD, Awe, 2017)

As earlier stated in this work, the Fulani enjoy their privacy, particularly, the females. Thus, privacy is considered in the building pattern and architectural design. The female apartments are behind the main building and surrounded by high walls to keep it out of public sight and access. The female areas are termed “Bashigated” areas as stated by the researcher. It is a term coined from the Fulani word, *Ba Shiga* meaning “no entry”. In this wise, and as a projection of privacy, Fulani women are scarcely seen, both in public and in their homes, except by persons with genuine access to the building. The *purdah* may be another metaphor for the value of protection and restricted visibility for women. As the researcher could observe, the *purdah* (the seclusion of women) is a value with religious roots. In the same vein, the Bashigated area is a response to an Islamic injunction that stipulates the privacy and seclusion of women in *Purdah*. *Purdah* in the Islamic religion is intended to screen away males who are not related to a woman. Such men or males include male visitors and male family members who are not the woman's sons, brothers, or husbands.

However, aside from the homesteads for sleeping or resting, each compound has at least a place for tethering animals. The females are not left out in the household architectural designs. They provide structure for cooking activities for both household and commercial consumption. The kitchen (see plate 17) and the granary (see plate 14) remain exclusively a female preserve. The Fulani men avoid these areas, including the buildings that are women's affairs. One of my informants, a woman of petite build XF1, gave the information on their privacy, the inner room allocation, and sexual relationships.

There are three major architectural forms found in the dwellings of the Settled Fulani of Oke-Ogun, namely; i. the traditional form ii. the hybrid form and iii. The contemporary form. That the sociocultural values unearthed in the Oke-Ogun architectural designs of both their dwelling arrangement and building styles include religious value, gender value, and economic and ecological values.

The study also noted that the preservation of their architectural types is important to them as it serves as identity-building and identity-preservation, and to their host communities, as keeping in check of perceived excesses of the Settled Fulani population and maintenance conflict as well as the formation of land-use policy. And lastly, the architectural designs of the Settled Fulani can help boost the economy of the communities if given attention. The uniqueness of the relationship between the hosts and the settlers can help in answering the many questions bothering the Fulani outlook in the larger Nigerian state. The Oke-Ogun typifies the “Unity in diversity” mantra from the cordial relationship the settlers and hosts enjoy there. This can be replicated in other parts of Nigeria where the problems of herdsmen and native populations are raging now. For further economic gains, a tourist economic plan can be achieved, where public education can be initiated about the systemic acculturation that could help settlers and host communities coexist without life-threatening conflicts. These buildings can be encouraged to be built by other ethnic groups considering the ecological implications and the cost-effectiveness. Lastly, it has tourist potential as it is an indigenous knowledge system of architecture and engineering that needs to be preserved for posterity.

#### **The study in general established that:**

1. The Fulani people of Oke-Ogun area of Oyo State claimed to have settled down in the area for over a century. The Settled Fulani in Tede even have a history as old as the town itself. Many other Fulani

nomads joined as the town expanded and decided to live permanently with the Yoruba indigenes.

2. The Fulani settlers came with their architectural designs and that is quickly sighted on getting to the Oke-Ogun area. The building styles of the Fulani under focus are not different from those described in the literature. However, the study found that there are observable changes in both the architecture and settlement patterns engendered by the influence of acculturation by the host community.
3. As opposed to the famous assumption that the Fulani are isolated and do not have familial interaction or relationship, the study established that social interaction and cohesion among the Fulani in Oke-Ogun is strong. Through observation and interaction with the Fulani in Oke-Ogun throughout the study, it is found that they consider themselves indebted to one another and as such they assist friends and families in erecting their structures. This heightens social interaction, allows for closer relationships and ties, and settles the demand for labour and the cost attached to it.
4. The design and patterns of their architecture have deep socio-cultural cum religious undertones with exact semblances of what obtains in the north, the social imagery of their public space is largely Islamic/northern in appearance and feel, depicting a northern atmosphere and ambience. They hold the belief that materials used for constructing their homesteads are ecologically friendly and do not pose any significant threat to nature (since they are made of bio-degradable material) and help them maintain regulated temperatures in harsh weather conditions. However, these materials are becoming less and less available due to the impact attacks from termites and other insects, drought and other ecological factors present in Oke-Ogun. As such, opting for available materials and adopting contemporary architectural designs for their homesteads.
5. The original beliefs and values of the Fulani society including those that relate to dwelling or settlement making and architectural designs are slowly being eroded particularly by the impact of the Yoruba culture found in the host community and partly by modernity. As such, some houses are now seen in bricks and corrugated iron roofing and the purdah system highly celebrated in the north is almost unseen in Oke-Ogun. Special spaces are also now allocated to women as cooking spaces or kitchens which was hitherto not so in traditional Fulani architecture. However, they still hold their core beliefs and values in high esteem, particularly those that set them apart and are not willing to let go. One such value is indigenous architectural technology. They all want the architectural designs kept in their originality, or at worst, in syncretism with Western Yorubarized architectural forms.

The study has focused on the patterns of architectural designs, settlement patterns and eco-cultural undertones of Settled Fulani in the Oke-Ogun area of Oyo state Nigeria. The study made attempts at understanding the reasons why the Fulani in Oke-Ogun build or fashion their architecture in the manner with which they do and the consequences of these patterns for their social organisation and settlement patterns. The study established that Fulani architectural patterns and designs are closely tied to environmental factors, religious factors and socio-cultural factors. As such, certain materials are used to ensure that conducive atmospheric conditions are obtained within the buildings even when general weather conditions are harsh or almost unbearable. The study also attempted to understand the tourist potential in the material culture to their buildings and styles of architecture. As we have attempted to show in the study, the Fulani in Oke-Ogun consider themselves indigenes of the community, claiming to have settled there over a century ago, however, they trace their origin to the northern

parts of Nigeria with specific references to the Ilorin migrants. They are also entirely Muslim, and the ambience of their community depicts this fact. Their social organisation and sense of community are also reflected in the placements of their huts and general allocations of spaces in their homesteads. Their pattern of settlements also echoes the prevalence of patriarchy, as a typical Fulani settlement is built around the hut of the family head.

The study established that there is a need to conserve the architecture of the Fulani settlers around the Oke-Ogun area, as this is an authentic material aspect of their culture that can give immediate details about their origin, history, and identity. It is also Fulani's justification for touristic value. It is an indigenous knowledge system of architecture and engineering that needs to be preserved for posterity. This justifies its location within the domain of the tourist industry, for economic development and resources for education.

Finally, as rich and interesting as the Fulani architectural pattern and design are, they are slowly being eroded by the influence of acculturation (particularly from the host Yoruba community) and modernity. The study shows that certain changes have surfaced in traditional Fulani architecture as found among the Settled Fulani in the Oke-Ogun area of Oyo state, due to constant contact with the culture of the host community. As established by the study, the building materials of Fulani dwellers in Oke-Ogun are frequently attacked by termites and other insects, coupled with the fact that ecological situations in the area do not fully support the growth of these materials. Hence, due to unavailability, these materials are replaced by modern building materials as used by members of their host community.

In conclusion, three major architectural forms are found in the dwellings of the Settled Fulani of Oke-Ogun, namely, i. the traditional form ii. the hybrid form and iii. The contemporary form. The socio-cultural values unearthed in the Oke-Ogun architectural designs of their dwelling arrangement and building styles include religious value, gender value, and economic and ecological values. The study also noted that the preservation of their architectural types is important to them as it serves as identity-building and identity-preservation, and to their host communities, as keeping in check of perceived excesses of the Settled Fulani population and maintenance conflict as well as the formation of land-use policy. And lastly, the architectural designs of the Settled Fulani can help boost the economy of the communities if given attention. The uniqueness of the relationship between the hosts and the settlers can help in answering the many questions bothering the Fulani outlook in the larger Nigerian state. The Oke-Ogun typifies the “Unity in diversity” mantra from the cordial relationship the settlers and hosts enjoy there. This can be replicated in other parts of Nigeria where the problems of herdsmen and native populations are raging now. And for further economic gains, a tourist economic plan can be achieved, where public education can be initiated about the systemic acculturation that could help settlers and hosts communities coexist without life-threatening conflicts. These buildings can be encouraged to be built by other ethnic groups considering the ecological implications and the cost-effectiveness. Lastly, it has tourist potential as it is an indigenous knowledge system of architecture and engineering that needs to be preserved for posterity.

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## 2.AGENDA 2030/SDG 16's Key Performance Indicators and Targets - Measuring the Nigerian Scorecards

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### **Abstract**

The SDGs were formulated in 2015 by the United Nations General Assembly (UNGA) where Seventeen Agenda for Sustainable Development Goals were drawn with specific targets for each goal. This is popularly called SDG GOALS or Agenda 2030. The seventeen goals are interlinked and not completely independent of one another. The main aim of the SDGs is to create a better living condition for the present generation inhabiting the world without compromising the rights of the later generation. All the countries/member states of the United Nations are urged to work towards attaining the set goals using the targeted indicators as benchmarks. Nigeria as a country is committed to the letters and spirits of the SDGs, as a result, it has integrated the goals into its several domestic programmes. Apart from directly integrating the goals Nigeria like other members of the United Nations is expected to run a governance that will reflect all the goals of Agenda 2030. Various giant strides have been made in the same direction by Nigeria though with little success. The crux of this paper is to discuss how far Nigeria has reflected Goal No. 16 of SDG. This paper establishes the nexus between Goal 16, its key performance indicators the principle of constitutionalism, the rule of law, and other ingredients of modern democratic good governance. It is found that all the ingredients of good governance and constitutionalism principles are like the SDG 16 targets; therefore, efforts towards achieving one ultimately lead to the success in the other. Benchmarking the Nigerian legal structures and their dynamism and socio-economic and political situations vis a vis the SDG 16, the paper concludes that the country's performance is abysmally poor. The same position is confirmed based on the extant statistical data and empirical evidence within the context of the discussion of the subject matter. The paper notes that Nigeria has the capabilities and potential to realise the lofty SDG Goal 16 but this will require being faithfully committed to the ideal of constitutionalism, good governance, and the rule of law promised in its constitutional and legal order. The paper recommends strong political will, mobilisation of available resources and credible leadership and manpower for the implementation of the relevant legal framework, policy interventions, initiatives and advocacy that could drive the zeal to achieve the ultimate goals of SDG 16.

Keywords: Sustainable Development Goals, SDG 16, Constitutionalism, Rule of Law, Good Governance

### **Introduction**

In a couple of days from now particularly on the 25<sup>th</sup> day of September 2023, the world will be marking the eight years of the adoption of the Agenda 2030. By the said date, it will remain just seven years to reach the targeted year 2030 which year is to mark the actualisation of the sustainable development goals otherwise known as SDP. The world represented by 189 countries came together and set 17 Sustainable Development Goals (SDGs) and 169 targets for themselves to work towards and accomplish by the 15<sup>th</sup> of September 2030. The idea behind the SDGs is to bring about a comprehensive 'plan of action for people, planet and prosperity'. The 17 Sustainable Development Goals call for action by all countries to transform our world in a way that promotes economic growth, while at the same time addressing a range of social needs, such as health, education and social protection, as well as environmental protection and climate change.

Many scholars in the fields of Science, Law, Humanities and Arts have defined Sustainable Development Goals (SDG) in many ways according to their perspectives. However, the best fitting definition of Sustainable development is that of development that meets our present needs without compromising the ability of future generations to meet their own needs. It comprises various components which include economic development, social development and environmental protection. It is pertinent to note that all 17 goals have a collective goal focus which is to ensure that our world becomes a better place to live for the present and future generation generations.

## Mainstreaming SDGs into Nigerian Governance

Immediately after the adoption of SDGs which is an unfinished business of MDG 2015, the Nigerian government has manifested its commitment to the implementation of SDG goals in various ways. The three organs of government are all keyed into means of mainstreaming sustainable development goals in Nigeria. At the head of the executive is the President. During the time of President Muhammadu Buhari, he handed over the power to President Bola Ahmed Tinubu on the 29<sup>th</sup> of May 2023, it is significant to note that he created the Office of the Senior Special Adviser to the President on SDGs. This office is directly under the Presidency. This greatly underscores the importance and significance of the SDGs in the Nigerian governance structure. The federal government similarly took cognisance of SDGs in the government planning and budgeting to make it easy for implementation of the SDGs programmes and policies to be carried out. The government has the mandate to ensure that all its developmental activities are directly for the benefit of the citizens and that they must be carried out in line with the framework of the sustainable development goals.

In the implementation process, the necessary stakeholders are involved to give support to the Nigerian government. These include the United Nations Office in Nigeria and the United Nations Development Programme (UNDP). Both offices have been giving necessary technical support to the Nigerian government in its bid to implement policies. According to the Special Adviser to the President on SDGs, since the historic adoption of the 2030 Agenda for Sustainable Development Goals by Nigeria, the government has continued to demonstrate commitment to the overall implementation of the SDGs, including the timely establishment of institutional frameworks to ensure effective implementation of the Global Goals.

On the 7<sup>th</sup> of June 2021, the office of the Senior Special Assistant to the President on Sustainable Development Goals (OSSAP-SDGs) launched the *Nigeria Sustainable Development Goals Implementation Plan 2020-2030*. All 36 States and Federal Capital Territory were invited to Abuja for a workshop on Advocacy and Capacity Building on SDGs Mainstreaming. Speaking at the occasion, the Special Assistant to the President on Sustainable Development Goals revealed thus:

In the last five years, we have worked closely with the United Nations Development System and our development partners to strengthen SDGs implementation capacity at all levels of governance in Nigeria. Such strategic partnerships and support demonstrate our collective commitment to the transformative promise of the 2030 Agenda ... “Indeed, this engagement is a conscious attempt at supporting the state governments to prioritise and mainstream the SDGs into their medium and long-term development policies and plans.

While analysing the depth of the integration of SDGs in Nigeria the learned author Ignatious Agueze revealed a few things about the mechanism introduced by the Nigerian Federal Government towards the implementation of SDGs. He observed as follows:

*There is the Senate Committee on SDGs which provides oversight functions for SDGs while the Federal House of Representatives Committee on SDGs provide appropriation for SDGs. There is also an inter-ministerial Committee on the SDGs. There is a private sector advisory group and a civil society strategy group on SDGs. The Federal Government worked together with the state*

*governments through their SDGs Desk Officers. These are the people who implement the SDGs in their different states and local government areas.*

Nigeria's 2020 Voluntary National Review (VNR) on Sustainable Development goals showed that there have been great efforts made at accomplishing SDGs. The country outlined the institutional dimensions for creating an enabling policy environment for the implementation of the SDGs through its Economic and Recovery Growth Plan (ERGP) (2017-2020). The ERGP's focus on economic, social and environmental dimensions of development makes it consistent with the aspirations of the SDGs. The report featured the efforts being made regarding Education and the key challenges confronting the country. Issues relating to health and other important sectors of the economy are discussed in the report. The report stated that there was alignment of national planning to SDGs and efforts being made towards the domestication process of the SDGs in Nigeria.

### **GOAL 16 of Sustainable Development Goals and Nigeria**

This paper centres on GOAL 16 (hereinafter referred to as SDG 16 in this write-up) which is about promoting peaceful and inclusive societies, providing access to justice for all and building effective, accountable and inclusive institutions at all levels. Goal 16 aims at ensuring that people everywhere should be free of fear from all forms of violence and feel safe as they go about their lives whatever their ethnicity, faith or sexual orientation. SDG 16 is basically on the entrenchment of Peace, Justice and Strong Institutions in a country therefore to achieve this goal would require meeting up with certain targets prescribed by the SDG itself. These targets are prescribed by the United Nations for each of the goals. SDG 16 targets include the following:

*Absence of violence, Rule of law, Access to Justice, Reducing Corruption and Bribery, Inclusive Governance, Legal identity including birth registration, Combat Terrorism and Crime, Accountability and Transparency, freedom of Information and non-discriminatory laws.*

Ignatius Nnamdi Aguene, "An Appraisal of the Implementation of Sustainable Development Goals 2030 in Nigeria" Department of Sociology and Psychology Godfrey Okoye University, Enugu. Journal of social sciences, Enugu University for Science and Tech, Vol 6 Issue 2 2021.p212.

[The Sustainable Development Goals Report 2023](https://www.un.org/sustainabledevelopment/peace-justice/). Available online at <https://www.un.org/sustainabledevelopment/peace-justice/> accessed 5<sup>th</sup> August 2023.

The significance of SDG 16 cannot be overemphasised. Some scholars have expressed the opinion that SDG 16 is an enabler of other goals. I completely align myself with this opinion because attaining all SDG 16 targets and meeting up with all its indicators would no doubt require practising the ideal of democracy, good governance, respect for the rule of law and protection of the human rights of citizens which are the goal of every modern democratic government. Against the above background therefore, this paper submits that upholding the ideal of SDG 16 would necessitate legal intervention in terms of promulgation of enabling laws, adherence to the principle of constitutionalism, rule of law, policy guidelines, strategic planning and strong advocacy. As a result, there is a causal link between the law and developmental changes envisaged by SDG 16. No doubt, the law being an instrument of social engineering has a tremendous role to play in effecting the desired change.

### **Constitutionalism and SDG 16 – Nigeria Position**

A quick review of the political history in Nigeria reveals that from the time of independence, the writers of the constitution in their wisdom have subscribed to the spirit of constitutionalism, ideals and objectives of good governance like the intent of Goal 16. In other words, all the indicators of SDGs are similar if not the same as the indices of constitutionalism, rule of law and good governance which are the foundations of Nigerian democratic governance. This can be deduced from the following Nigerian constitutional and legal order.

First, the preamble to the 1999 Constitution categorically affirms as follows:

*We the people of the Federal Republic of Nigeria, Having firmly and solemnly resolve, to live in unity and harmony as one indivisible and indissoluble sovereign nation under God, dedicated to the promotion of inter-African solidarity, world peace, international cooperation and understanding And to provide for a Constitution for the purpose of promoting the good government and welfare of all persons in our country, on the principles of freedom, equality and justice, and for the purpose of consolidating the unity of our people.*

In line with the above declaration in the preamble, the Nigerian constitution further guarantees in section 14 (1) that:

*The Federal Republic of Nigeria shall be a State based on the principles of democracy and social justice. Sub-section (2) further declares that: (b) security and welfare of the people shall be the primary purpose of government: and (c) the participation by the people in their government shall be ensured in accordance with the provisions of this Constitution.*

While the above constitutional provisions affirm the absence of conflict, peace, justice, egalitarianism, security

Underlined words for emphasis pointing to the Targets of SDG 16. The targets are also referred to as Key Performance Indicators.

and inclusiveness, section 16 of the constitution among other things further guarantees to control the national economy in such manner as to secure the maximum welfare, freedom and happiness of every citizen based on social justice and equality of status etc, It promises to promote a planned and balanced economic development; that suitable and *adequate shelter, food*, reasonable national minimum living wage, old age care and pensions, and unemployment, sick benefits and welfare of the disabled *etc*. Section 17 guarantees easy access to courts of law. equality of rights, obligations and opportunities before the law; the sanctity of the human person is recognised, and human dignity shall be maintained and enhanced *etc*.

Thus, Access to justice, Non-discrimination, socio-economic development, and reduction of poverty, among others are similarly guaranteed and promised by the Nigerian constitution being the highest law of the land. All these laudable constitutional provisions and many others scattered in Chapter 2 and Chapter 4 of the Nigerian constitution are in tandem with the aspirations of Goal 16 however there is a challenge of implementation as will be considered *infra* in this discussion.

Having established the nexus between Goal 16 key performance indicators (otherwise called targets) and the Nigerian constitutional and legal order, this paper shall endeavour to assess the success or failure rate of Nigeria in it strives to achieve all the targets highlighted above to determine how far or near Nigeria is to the ultimate SDG 16.

## **Principle of Rule of Law and SDG 16**

We have shown that the Nigerian constitution in its various provisions has encapsulated all the ideals and targets of SDG 16. Another strong indicator for meeting the targets of SDG 16 is for any country to adhere strictly to the principle of the rule of law. The definition of the rule of law in both conceptual and theoretical analysis as in the case of most legal phenomena can be very knotty, complex and intricate, The United Nations Secretary-General defined the rule of law as a principle of governance in which all persons, institutions and entities, public and private, including the State itself, are accountable to laws that are publicly promulgated, equally enforced and independently adjudicated, and which are consistent with international human rights norms and standards. The rule of law is both a legal concept and a political construct. It is about how societies are organized and how power is exercised. Peace, stability, human rights and effective governance, based on the rule of law, are central to the realization of Sustainable Development Goals.

The rule of law has also been defined as “the mechanism, process, institution, practice, or norm that supports

This is affirming the Goal 16 ideal of social justice, peace and inclusiveness.

The constitution further provides that the State shall promote a planned and balanced economic development; that suitable and adequate shelter, food, reasonable national minimum living wage, old age care and pensions, and unemployment, sick benefits and welfare of the disabled *etc*.

the equality of all citizens before the law, secures a non-arbitrary form of government, and more generally prevents the arbitrary use of power. The rule of law being a

constitutional concept remains the cornerstone of governance in any given polity. It means that everything must be done according to the law. This implies that both the government and the government must always justify their actions in law. Government business should be done to avoid dictatorial tendencies because if discretionary powers are allowed, those in government would use such to the detriment of the less privileged members of the society.

The major challenge here is that without an independent judiciary with incorruptible judges, the rule of law cannot be sustained. By the demands of the rule of law, the government and its officials are duty-bound to respect and obey the law in all its actions. This means every government must endeavour to minimize arbitrariness in its policies and use of power.

Unfortunately, in Nigeria, executives have always been flouting the rule of law with brazen recklessness. Most times, they assume the garb of dictatorship and turn the rule of law to the rule of man by following their interest. Established norms and rules are jettisoned and give way to the whims and caprices of individuals who are in public offices. In some cases, the Nigerian Judiciary has strived to uphold the rule of law by overturning those actions that are found contravening the position of the law and global best practices. What is more amazing is that Nigerian governments both at the central or state level deliberately disobey the order of the court at will. A few examples are given below:

### **Some Prominent Cases on the Operation of the Rule of Law**

In the case of *A.G. Federation v. G.O.K. Ajayi*, the respondent was at the airport when he was ambushed by the officers of the State Security Service (SSS). They pounced on him and forcefully demanded his passport and seized same. The Respondent approached the court and the High Court, awarded the sum of Two Million Naira damages against the Government. The SSS went on appeal and the Court of Appeal had this to say:

*“... even in the animal kingdom, there is still some decorum; there is still some decency. Strong and wild animals will not pounce on another animal the way the S.S.S. men did to the cross-appellant like an Indian rubber ball will pounce on the floor. Such brazen recklessness that went with the seizure of the plaintiff's passport at the time it happened, I would like to believe, would not be displayed in the thick*

The Rule of Law as used in this context is in its simplistic form and meaning. Jurists may argue whether rule of law is people-centered or state centred, whether the rule of law is “thin” or “thick”, Whether is about form or function, due process or substantive justice. Going into all these will derail us from the focus of the paper.

See the publication on United Nations and the Rule of Law, Source - Digital Library.

The Rule of Law was formulated by Dicey (1939) has three basic interpretations:

- a) There is the absolute supremacy of regular laws as opposed to the influence of arbitrary power.
- b) The rule of law clearly means that no man, irrespective of his social or official position, is above the law. Everyone is duty-bound to obey the same law.
- c) The rule of law holds that the legal rights of the subjects are secured and guaranteed in all ramifications. And these rights are to be protected and enforceable by law.

Choi, Naomi. "Rule of Law". *Encyclopedia Britannica*, 13 Jul. 2023 Available online at <https://www.britannica.com/topic/rule-of-law> accessed 16 August 2023

Obinna Mbanugo, “Human Rights and Duties in Nigeria, The Rule of Law,” *Unizik Law Journal* Vol. 15, 2019 p12.

*jungle. I only hope that such characters who revel in the brazen display of executive lawlessness will never rear their heads in this country again*

In another case of *A. G. Bendel State v. Aideyan*, the government acquired the plaintiff's building. This led to the plaintiff suing the state government. The court held that the right to property in Nigeria is entrenched under Section 40. The Supreme Court of Nigeria concluded that "the plaintiff's right is inviolable and such property, or any right attendant thereto can only be taken possession of or compulsorily acquired by or under the provisions of a law.

In *Governor of Lagos State v. Ojukwu* where the Military Governor of Lagos State disobeyed the court order, the Supreme Court held in favour of Ojukwu inter alia, that "*it is a very serious matter for anyone to flout a positive order of a court and proceed to insult the court further by seeking a remedy in a higher court while still in contempt.*"

Similarly, in the case of *Nigerian Army v. Mowarin Ubaezeonu* Justice of the Court of Appeal said:

*An order of Court must be obeyed even if such an order is perverse, until such a time that the order is set aside by a competent court ...a flagrant flouting of an order of the court by the executive is an invitation to anarchy*

In *Okogie v. A. G. Lagos State* the defendant in this case, that is, the Lagos State Government abolished private ownership of primary schools by issuing a government circular dated 26th March 1980, by which no private primary school will be allowed to operate in the State with effect from 1st September 1980. The plaintiff contended that the Government's action was in breach of the right to freedom of expression and press under the Constitution. The Court per Agoro J. held that the Lagos State Government had no power under the relevant laws to abolish private ownership of primary schools in Lagos. That the right of the plaintiff to own and operate schools under the Constitution must be protected.

The memorable case of *Shugaba v. Minister of Internal Affairs* centred on the order of the Executive to deport Mr Shugaba, a Nigerian citizen from Nigeria on the unfounded allegation that he was not a Nigerian, the Court held this to be a flagrant disrespect to the rule of law. The court further declared that the rule of law ensures equality of all persons without any distinction, that it also guarantees transparency and incorruptibility and must be preferred.

Ifedayo Akomolede & Bosede Akomolede, "Good Governance, Rule of Law and Constitutionalism in Nigeria" 1 Eur. J. of Bus. & Soc. Sci. 79 (2012).  
 (1989) All NLR 663.  
 (1986) 1 NWLR (Pt. 18), p. 622.  
 (1992) 4 NWLR (Pt. 235), p. 345.  
 (1992) 4 NWLR (Pt. 235), p. 345.  
 Okogie v. A. G. Lagos State (1981) 1 NCLR, p. 218.  
 Ibid.



One of the incidences depicting the height of infraction and disrespect for the rule of law occurred in the President Buhari era during the change of currency. The Supreme Court had ruled on a suit filed by the government of Kaduna, Kogi and Zamfara states against the Central Bank of Nigeria (CBN) and the Federal government that the old naira notes should be allowed in circulation along with the new notes until December 31, 2023, adding that the federal government's naira redesign policy contravened the 1999 Constitution. The President and the Governor of the Central Bank did not obey this order with immediate effect. Justice Emmanuel Agim of the Supreme Court remarked that:

*The rule of law upon which our democratic governance is founded becomes illusory if the President of the country or any authority or person refuses to obey the orders of courts. The disobedience of orders of courts by the President in a constitutional democracy as ours is a sign of the failure of the constitution and that democratic governance has become a mere pretension and is now replaced by autocracy or dictatorship.*

As rightly observed by Israel Ojoko in his article despite the Supreme Court ruling, for many days, all the bank directors, CEOs of companies, industries, wholesalers, retailers, markets and other Nigerians refused to abide by the judgement as all were waiting for the pronouncement of permission from either the President Buhari or Godwin Emefiele. This is a sad development in the country as the citizens did respect the dictatorial and discretionary power of the executives more than the order of even the apex court in Nigeria. It wasn't until the President cleared the air on the acceptability of the old currency that the Nigerians started to accept it.

Above are a few of uncountable situations in which the rule of law was brazenly flouted by the government.

### **Transparency, Accountability and Reduction of Poverty**

According to the United Nations Development Programme (UNDP 2002) 'good governance' is about striving for the rule of law, transparency, equity, effectiveness/efficiency, accountability, and strategic vision in the exercise of political, economic, and administrative authority. Transparency and accountability are 'two interrelated and complementary concepts' both of which are indispensable to any governance system. Transparency as one of the indices of good governance means openness in governance, where the ruled can trust the rulers and be able to predict the rulers to some extent. Transparent governance could be said to exist when the ruled have a very clear idea of what their government is doing. Put differently, transparent governance provides a forum whereby fiscal (monetary) operations and activities of government are reported to the public with absolute sincerity. Accountability, on the other hand, means 'responsibility' and 'answerability', where public officers are expected to perform their constitutional duties for the benefit of all the citizenry freely without discrimination. Accountability is also about holding public officers accountable for their actions and inactions either while in the office or after leaving the office. And maintaining honesty and probity in governmental businesses.

### **. Are Nigerian leaders or the Government Accountable?**

The challenge faced by Nigeria concerning transparency and accountability of the leaders is enormous. According to Adegami and Uche, most of the political leaders in Nigeria could best be described as political merchants. This is because; they see politics as a business deal that brings forth huge profits. Nigeria's political leaders do not believe in service to the people; instead, they are self-serving as they serve

themselves more than the governed, hence always playing politics of wealth acquisition. They strive to own fat bank accounts in Nigeria as well

as in foreign accounts across the world. This type of politics thus, becomes the bane of Nigeria's efforts at development.

### **Lack of Good Governance in Nigeria - Weak Institutions**

The former United Nations Secretary-General Kofi Annan sees 'good governance' as 'the single most important factor in eradicating poverty and promoting development' To Annan, a lack of good governance will continue to promote underdevelopment and hunger. It is through good governance that the impact of governmental activities can be felt, particularly around economic growth and development. The laxity in governance has also culminated in declining industries. Lack of good governance, infrastructural deficit and collapsed socio-amenities have led to the crumbling of many businesses and industries that have folded up. A few decades back in Nigeria there were, big companies and manufacturing industries of various kinds such as Peugeot Automobile Nigeria; Volkswagen Nigeria; Dunlop Nigeria Limited; Michelin Nigeria; BATA; Lennard; Kingsway; A.G. Leventis; and Phillip Nigeria, Sanyo, Singers and many others. Due to the bad economy and poor governance, they had left the shores of Nigeria for better places.

In a similar vein, industries such as Steel Rolling Mill, Osogbo; Steel Rolling Mill, Ajaokuta; Arewa Textile Mill, and Nigerian Airways are no longer functioning and no hope of revamping them. Developmental projects are not being pursued and, in a few cases, where contracts are awarded, they are inflated and abandoned halfway to completion. There are no clear-cut benefitting economic policies, Nigerian currency falls daily against international currencies of exchange, gross unemployment and high cost of living, decayed infrastructures and declining welfare and social facilities. This is the Nigerian pitiable situation with no hope in sight. Thus, public institutions that are expected to be strong become perpetually weak and moribund.

### **Non-Inclusiveness in Governance and Bad Leadership**

A quick review of Nigerian political history reveals that since Nigeria's independence, the country has been ruled by the same set of rulers under military rule and civilian rule. President Olusegun Obasanjo was the 5th president of Nigeria in 1976 under military rule and the 12th president in 1999. Yar Adua was the vice President during the Obasanjo regime in the military, he was the fifth civilian President. Goodluck Jonathan rose from deputy Governor to Governor, to Vice President

Israel Ojoko, *Of CBN and the Weakness of the Rule of Law*, The Cable News, March 15<sup>th</sup> 2023.  
Adegbami, Adeleke and Adepoju Banji, AFRREV VOL. 11 (4), S/NO 48, September, 2017 p146.  
Ibid, p 147.

See generally, Adegbami, A. & Uche, C. I. N. (2016). Despotism versus Good Governance: Challenges of Administration of Nigeria's Fourth Republic. *Journal of Developing Areas*, Vol. 50, Issue 4, pp. 195-210. (Annan, cited in UN 1998).

and finally became the President. Likewise, Muhammadu Buhari was the 7th president in 1983 under military rule and the 15th president in 2015. Bola Ahmed Tinubu was the civilian Governor of Lagos State for eight years, but he did not leave the control of the state till he eventually became the President of the Federal Republic of Nigeria. While submitting the list of his cabinet to the Parliament, names of former governors and ministers were featured. It will be premature to talk much on this since the Parliament is yet to screen all of them, nevertheless, are we saying there are no new persons who could hold these positions?

The Nigerian leadership structure is nothing but a recycling. From Chairman of Local Government to Commissioners and Special Advisers, House of Assembly members to House of Representatives or Senate, Chief of Staff to Governor, Governor to Senate or Minister. As far as recyclable, Nigerian politicians and leaders will not leave the scene until death does them part. There have been very few new politicians elected to office even where they appear to be new entrants, they must have been sponsored by the sit-tight godfathers. All these show that it is difficult to penetrate the leadership of Nigeria unless you belong to them or are sponsored by them. I quite agree with Charles Omole in his assertion that the entry into electoral politics in Nigeria has been made so difficult that only those approved by the political elites are elected. Where then is inclusiveness targeted by SDG 16?

### **Reducing Corruption and Bribery - is this true of Nigeria?**

SDG 16 envisages a system of polity where corruption will be reduced to the barest minimum and bribery and other forms of illegal gratification shall be greatly curtailed. Corruption is the bane of Nigeria. It has affected all facets of life, and no sector is left unaffected by the corruption and its effects. It causes untold hardship for the citizens and results in brain drain and capital flight as professionals leave the country and investors are discouraged. Corruption in all its forms is divisive, debilitating and extremely dangerous. Corruption is what has brought Nigeria to the brink of war and division.

The situation becomes most unfortunate and pathetic. There is a general breakdown of infrastructure and civic institutions, which in turn undermines a broad range of rights. Educational and health sectors become worst affected as both institutions collapse due to inadequate equipment and lack of basic amenities. The corruption in the leadership of the country

reigns supreme. The entrusted authorities use the instrumentality of the power and their position for private gain and selfish ends. They enthrone all forms of corrupt practices including bribery, embezzlement, fraud, extortion, favouritism, and nepotism. There is an army of unemployed highly educated persons and some other skilled persons. The leaders' insatiable quests for illicit wealth inevitably led to their inordinate desire to perpetually hold on to power. Consequently, political instability, socioeconomic crisis and poverty emerge because of the mismanagement of the country's natural resources. According to its (2020 index), Nigeria ranks 149<sup>th</sup> out of 180 countries on corruption. Yet it is supposedly committed to the ideal and spirit of SDG.

### **Insecurity and Conflicts**

The central idea or mantra of SDG 16 is peace and no violence. This is not the case with Nigeria, a country that has experienced more terrorist attacks than any other country in West Africa. Nigeria is bedevilled with insecurity which includes terrorism, kidnapping, banditry and ethnic militia. Boko haram is the main terrorist organisation in Nigeria. It has wreaked a lot of havoc causing the death of thousands of people and rendering

Charles Omole, How to Keep Politicians Accountable and Also Legally Change a Government, <https://charlesomole.org/how-to-keep-politicians-accountable-legally-change-a-government-a-possible-strategy-for-Nigeria/> (last visited Dec 30, 2021).

thousands homeless and internally displaced. It is generally acknowledged that terrorism is the use of violence and intimidation to achieve certain goals. The goals may be political, ideological, cultural and religious among others. The action of the terrorists always targets civilians and facilities or systems on which civilians rely. Many of the Chibok girls who were victims of terrorist attacks are still in captivity to date. Many public places have been bombed, an uncountable number of civilians have lost their lives and thousands have been displaced. Nigeria has witnessed uncountable incidents of bomb blasts and random killings.

Concerning ethnic militia, the position of Nigeria is not better. Nigeria is made up of about 250 ethnic groups.<sup>7</sup> Each of the ethnic groups is identified with peculiarity and cultural differences and idiosyncrasies, as a result, they live together with mutual suspicion, and prominent ones are on each other's throats. The country does not enjoy cooperation due to ethnic rivalry and fear of domination of one ethnic group by the other. Everything is patterned along ethnicity and tribal sentiments. There have always been incessant wars and violence and threat to peace by many militias like the Boko Haram sect, the movement for the

Emancipation of Niger Delta (MEND) the Ijaw Youth Congress (IYC); Various non-state actors Egbesu Boys; Oodua People's Congress (OPC); the Arewa Consultative Forum (ACF); the Movement for the Actualization of the Sovereign State of Biafra (MASSOB) and others. The actions and inactions of these groups have contributed immensely to the increasing cases of internally displaced persons in Nigeria.

As at the time SDG was adopted in 2017 the statistical data gathered concerning the number of victims of insurgency reveals that about 66,087 of the IDPs were displaced by natural disasters while 915,329 were affected by the insurgency in the northeastern part of Nigeria. It was further noted that there were 20 IDP camps across the northern part of the country. There seems to be no end to all these crises in the country as the law enforcement agents are overwhelmed by the various groups causing chaos in the country.

### **Access To Justice in Nigeria**

Goal 16 advocates access to justice as one of its key performance indicators. Nigeria has one of the most robust and sophisticated judicial institutions in Africa. Our statute books are full of protectable guaranteed rights. The procedure for enforcing these rights through a standardized and developed judicial system is not in doubt however, in Nigeria, there is still much to be desired in terms of the individual citizen's access to justice. Most of the rights guaranteed in our constitutions and other statutes only exist on paper because of the inability to access justice. Many factors are responsible for this but the most pervasive is the issue of poverty. The delay in accessing justice is another factor since cases last several years and decades to complete. Orimobi aptly captured the situation when he posited that there can be no actual guarantee of the right to life where people do not have the right to food, shelter, health and education. Neither will the right to dignity of the human person in section 34 of the 1999 Constitution make any meaning in the face of acute unemployment as citizens would be unable to live any dignified life without jobs.

F.A.R. Adeleke. Leadership, Good governance and Human Rights Issues in Nigeria, Chapter 24 of the Book 'Legal Prisms – Direction In Nigerian Law And Practice' Published by Faculty of Law, Usmanu Dan Fodiyo University of Sokoto March, (2012) pp.340 – 361.

Transparency International, Corruption Perception Index 2020. Available at: <https://www.transparency.org/en/cpi/2020/index/nga>. Accessed on 15/06/2021 at 10:26am.

Transparency International, Corruption Perception Index 2020. Available at : <https://www.transparency.org/en/cpi/2020/>

The role poverty plays in the enforcement of citizens' rights is very paramount. Litigants can only approach courts to enforce their rights with the aid of lawyers and filing of processes, all of which ultimately require money. The cost of litigation is a potent factor inhibiting citizens

from seeking judicial redress. A poor man finds it difficult or unaffordable to fight for judicial redress of his rights. As was noted by Krishna Iyer in his article "Law versus Justice":

The scales of justice are inevitably weighed in favour of the richest people, who can afford the best lawyers and advice, whereas the person of average income may be excluded from his rights unless he is so irresponsible as to gamble, since there is always a risk that even a small claim might escalate to the House of Lords, wafted on a legal nicety which may be interesting but could result in bankruptcy for him and his family.

Most Nigerians live in abject poverty and where their rights are infringed upon, they cannot seek redress because of the cost of litigation. Julius Ihonvbere rightly pointed out that human rights mean very little within a context of mass poverty, unemployment, illiteracy, hunger, marginalization, and the general lack of basic human needs. Therefore, as long as poverty continues to reign supreme in the everyday life of an average Nigerian, the will, determination and all efforts to fight for judicial redress of his infringed rights remain elusive and unrealizable.

### **Ineffective and Inefficient Judiciary --- A Pitiably Weak Institution**

While Nigeria is expected to work towards strong institutions in line with the mandate of SDG 16, It is very unfortunate that the judicial institution that is supposed to be among the strongest in the country is now laden with a lot of challenges. To say that Nigeria's judiciary is ineffective and inefficient is nothing but the obvious. Myriads of factors may be responsible for this weak institution details of which may derail from the focus of this paper. Nevertheless, Nigeria's judicial system does not uphold the rule of law. The public has lost confidence in the judiciary due to the lack of integrity of those personnel manning the courts. One important factor that may ensure the effectiveness of the judiciary is the payment of adequate remuneration, wages and allowances to judges. Related to this is the provision of adequate infrastructural facilities

[index/nga](#). Accessed on 15/06/2021 at 10:26am.

Good governance and Human Rights Issues in Nigeria, Chapter 24 of the Book 'Legal Prisms – Direction In Nigerian Law And Practice' Published by Faculty of Law, Usmanu Dan Fodiyo University of Sokoto March, (2012) pp.340 – 361.

1 Krishna Iyer, "Law versus Justice," Deep & Deep, New Delhi, (1981) p. 81).

Julius Ihonvbere, "Underdevelopment and Human Rights Violations in Africa" in Shepherd & Anikpo (eds), *Emerging Human Rights*, New York: Greenwood Press, p 64.

F.A.R. Adeleke, note 33 above.

with which judges would work. Thus, the judiciary must be well-funded. It has been observed that an underfunded judiciary will be handicapped in performing its role.

In the words of a Nigerian Supreme Court Justice, Pius Olayiwola Aderemi “...a judiciary that is not independent – a judiciary that goes cap in hand to beg for money to run its affairs can never and should never be expected to discharge its sacred duty of dispensing justice in the ideal way it should.”

A poorly funded judiciary may not be free from political influence and cannot be pro-active. In some states, the salary of a Senior Magistrate is less than the take-home pay of a newly employed bank worker. In all the thirty-six states in Nigeria, the National Judicial Council determines the salary of judges while each state decides on allowances. Only a few states do remunerate their judges and Magistrates very well in terms of allowances. It is however unfortunate that members of the magistrates in most states including Lagos State are poorly remunerated. In Lagos state, for instance, many magistrates get paid as low as N150,000 per month. A chief magistrate takes home less than N300,000.00 at the end of the month. The highest-paid Chief Magistrate Admin earns less than N450,000 (take home) a month and such a person in most cases had been on the bench for not less than 15 or 20 years aside from the period of his practice as a legal practitioner.

Nigerian Judiciary lacks integrity, and the citizens do not repose confidence in them because they do not adhere to the truth, soundness, uprightness and purity. According to Saulawa, JCA., in the Nigerian case of *Salvador v. INEC & Ors.*,

... There is no doubt that public confidence in the independence of the courts, in the integrity of Judges that man such courts, and in the impartiality and efficiency of the administration of justice, play a great role in sustaining the judicial system of a nation.

This is not the kind of judiciary envisaged by the spirit and intent of SDG 16.

The Introduction of Plea Bargaining in Nigerian Courts depicts the basis of Inequality in the polity. The system of plea bargaining has been used to resolve high-profile criminal cases which involved the stealing of large sums of public money a fraction of which the defendants are only made to return. Most prominent and high-ranked public officers opt for plea bargaining to escape being punished for their corrupt activities There is no equality before the court in terms of the application of laws to punish the offenders in our courts. Cases decided by the Nigerian judiciary through plea bargaining give the impression that plea bargaining is a means by which the rich

Justice Pius Olayiwola Aderemi, “The Role of a Judge in the Administration of Justice in Nigeria” in J. A. Yakubu, (ed.), *Administration of Justice in Nigeria: Essays in Honour of Hon. Justice Muhammed Lawal Uwais*, (Lagos, Nigeria, Malthouse Press Limited, 2000), pp.79-100, at 81.

See, Taiwo Osipitan, “Safeguarding Judicial Independence Under the 1999 Constitution”, in Yemi Akinseye-George and Gbolahan Gbadamosi, (eds.), *The Pursuit of Justice and Development: Essay in Honour of Hon. Justice M. Omotayo Onalaja* (Lagos, Nigeria, Diamond Publications Ltd., June 2004), pp. 10-31, at 14.

[2012] 7 NWLR (pt. 1300), p. 417.

who stole the lifeblood of the poor are made to return part of it and are then let off the hook. For instance, Dieprieye Alamiesiegha, former Governor of Bayelsa State was convicted of stealing public assets worth over \$100 million and got away with imprisonment for two years and an order of asset forfeiture for only those assets that were traced. Lucky Igbinedion, former Governor of Edo State, was given a fine of less than \$20,000 on conviction also for theft of public assets and breach of public trust. Many others in this category need not be captured in this write-up in order not to derail. Suffice to say that the idea of plea bargaining in high-profile cases involving politicians is a “legalised judicial compromise and travesty of justice” Where then are the principles of equality and egalitarianism, justice and equality in the SDG 16?

### **Violence And Kidnapping**

Prominent among the Key Performance indicators of SDG 16 are Combating Crime and the Absence of Violence. Every member state must ensure there is peace in their country. However, Nigeria has not succeeded in achieving this feat. Kidnapping has become an uncontrollable epidemic in Nigeria. It was first known as one of the rare crimes embedded in society but has in recent times metamorphosed into a high-profile criminal act. It was brought into limelight and assumed prominence during the insurgency of the militant groups in the Niger Delta. During that time the foreigners who worked in oil companies were being held captive to protest the degradation caused by the activities of those oil companies to the land of the natives. At present, across the entire Nigeria, the virus of kidnapping is no respecter of any person, irrespective of whatever tribe such a person belongs, his social class, or religious affiliation, therefore victims of kidnapping include the rich, the poor, persons of average personalities, male or female, young or old provided such a person has a relative who could be blackmailed into coughing out money as a ransom. The crime parades victims from the entire spectrum of the country ranging from top political appointees and their spouses to civil servants, Academics, students, Businessperson, journalists, etc. In most cases, women captives are subjected to sexual abuse and rape. phenomenon of Kidnapping in Nigeria has reached a proportion where nobody living in any part of Nigeria can be said to be free or safe from being kidnapped. All major cities in Nigeria have become unsafe.

Factors that have been linked to the increase in kidnapping cases in Nigeria include the distressed economic situation in the country, the high unemployment rate among the youths, and an inefficient and corrupt police force that is ill-equipped to fight the crime. It is said that the widening gap between the rich and the poor which keeps on increasing by the day has led to the average youth having difficulties in securing legitimate means of earning a living. As a result, they have taken up kidnapping as a profession since they see it as a money-generating tool. It is therefore a fact that the phenomenon of kidnapping is inextricably linked with the effect of

See Oluseyi Olayanju, “The Relevance of Plea bargaining in the Administration of justice system in Nigeria”. LASU Law Journal. Vol. VIII. Nos. 2 & 3. Dec 2011/ Jan 2012.

Tafa Balogun, former Inspector-General of Police, a lawyer, stole assets worth over \$130 million and was sentenced, on conviction to imprisonment for a mere six months. And Mrs Cecilia Ibru, Chief Executive Officer of Oceanic Bank, was convicted of stealing assets worth over \$2billion and was sentenced to six months imprisonment, a term that was mostly served in one of the best hospitals in the country.

bad governance in Nigeria which should be seen as a major challenge. Without tackling violence, kidnapping and other similar insecurity, there can never be peace rather, the only guarantee will be that those whose insecurity claims their lives will be wished to Rest in Peace.

## **Conclusion**

### **SDG 16 and its Targets -- How Far or Near Is Nigeria to the Promised Land?**

Having discussed most of the indices of good governance which this paper submits are the same as the key performance indicators of SDG16, the paper has shown that Nigeria has not met all that is required. The achievement may not be a total or absolute failure but in ascertaining the actual position of the country as to how far or near it is to the promised land it will be necessary to infuse this discussion with statistical reality and figures. To this end, the following statistics may further inform our conclusion.

- With regards to the state of insecurity, it has been revealed that the non-State Actors in Nigeria have killed 4, 545 people, while the number of the persons kidnapped is 4,611 in 2022.
- Concerning Poverty, a staggering figure of malnourished children is put at nearly 6 million children aged 0-59 months
- According to the 2022 multi-dimensional poverty index Survey, 63% of persons within Nigeria (13 million people) are multidimensionally poor.
- The National MPI is 0.257% indicating that poor people in Nigeria experience just one-quarter of all possible derivation
- The Overall annual GDP growth rate in 2022 stood at 3.10% from 3.40% reported in 2021. An obvious decline is recorded.
- The unemployment rate for 2022 was 5.76%,
- Data on access to Justice reveals that the figure of unjustly treated people in Nigeria is 140 million people
- 3,167 inmates across the custodial centers in Nigeria are on death row, 51,178 inmates are awaiting trial out of which 50, 955 are males, 1223 are females
- According to the Independent Corrupt Practices and Other Related Offences Commission, the Nigerian judicial sector is currently on top of the Nigeria Corruption Index between 2018 and 2020.
- The extant data on bribery shows that about N9,457,650,000 was offered and paid as bribes by lawyers to judges.
- Unemployment statistics show that Youth unemployment is 42 % while underemployment is 21%.

The then Chairman of the Academic Staff Union of Universities, ASUU, Delta State, Dr. Emmanuel Mordi told vanguard that the lecturers were particularly disturbed, as educators are not millionaires, but the gunmen keep attacking them.

The country has lost count of the number of expatriates who had fallen victims, the academic community has not been spared as several lecturers had fallen victims, artisans, average income earners etc, have not been spared.

Source - Nigeria IPC Malnutrition Analysis Report (May 2022- April 2023).

(Source NBS) 2022.

Source -NBS).2022.

(Vanguard. Com 2022).

Spokesperson of Nigerian Correctional Services, Mr Abubakar Umar made this known at media parley on December 15<sup>th</sup> 2022 in Abuja,



- The 2022 report on the performance of Nigeria published in 2023 about SDGs generally revealed that Nigerian achievement is just less than 14%, its limited progress is 51% and its worsening condition is 35.8%.

Finally, without mincing words, it is our submission that Nigeria has terribly failed to meet the above responsibilities arising from SDG 16 and has also failed to reflect all the indices of a country promoting the principle of constitutionalism, rule of law and good governance. Since good governance is the goal of SDG 16 one cannot conclude otherwise that the country has not met with the expected outcome.

Nevertheless, the country has enough potential to realise and achieve SDG 16 first, it requires strong political will, mobilisation of available resources and manpower for the implementation of the relevant legal framework, policy interventions, initiatives and advocacy that could drive the zeal to achieve the ultimate goals.

Second, it is one thing to join the world in carrying out the assignment of SDGs, it is more important that the country is being led by a leader having the interest and political will to drive the impetus towards the achievement of the set objectives. Only a credible good and responsible leader can do this. It is therefore imperative that Nigeria takes up the issue of leadership as a challenge. The role of leadership needs to be clearly understood, appropriate modalities of nurturing and appointing dynamic leadership must be developed, and critical is the need to foster accountability and transparency in the exercise of leadership functions. A major challenge is to transcend the notion of leadership from being a personalised preoccupation to the building of a culture of leadership being an institution. Unless these are realised, there can be no political will to drive the concept of good governance which will in turn be a positive way of accomplishing the set targets of SDG 16 and other SDGs.

Dr. Salim Ahmed Salim, former OAU Secretary General, “*Africa Faces Peace, Leadership and Governance Challenges*” Africa News Service, July 2, 2002.

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