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Determinants of Supply Chain Management and Logistic Operations of Refineries in Niger Delta

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ABSTRACT

The study examined the factors affecting supply chain management and logistics operations of refineries companies in Niger Delta, Nigeria. The study utilized a structured questionnaire to elicit information from respondents from the supply chain management (SCM) and petroleum product marketing company (PPMC) subsidiaries of the NNPC in Port Harcourt, Rivers state and Warri, Delta state. The population of the study consists of all public and private oil refineries/companies (petroleum and petrochemical) in the Niger Delta region which stood at 6,621. Taro Yamane (1967) formula was employed to determine the sample size 400 of staffs of the SCM and PPMC. A total of 307 copies of the questionnaire were retrieved for the study which indicated 86.5% return rate for the study. Descriptive statistics in form of Tables, percentages, and charts and inferential statistics in the form of ANOVA analysis and Student T-test statistics were employed for data presentation and analysis. The major factors affecting supply chain management (SCM) and logistics operations of companies are low feedbacks, poor monitoring strategies, low level of supplier collaboration and ineffective product transportation to consumers. The factors contributing to petroleum product distribution shortages and drivers of disruptions are the same in the study area this made petroleum product distribution performance poor and are the result of ineffective supply chain management (SCM) of oil refining companies in the study area. In conclusion, several challenges were identified as hampering their performances overtime which were basically directed at poor capacities which are currently hindering the refineries practices over the application of efficient supply chain management (SCM) systems. Thus, the study recommended efficient coordination of supply chain (SC) and logistics from refining, storage, marketing to final distribution of product in the study area.

Keywords: Logistics, Refineries, Supply Chain

Introduction

The supply chain management in a Petroleum industry as described by Chima (2007) is the configuration, coordination and continuous improvement of sequentially organized operations involved in upstream, midstream and downstream. Supply chain and distribution means the formation of such a sales network, in which necessary goods will be delivered to the right place at the right time with the least cost. The concept of supply chain and distribution is aimed at creating optimal channels of interaction with distributors and end users.

It is virtually inconceivable in today's economy for an oil and gas firm to function without the aid of an effective supply chain because it is an essential ingredient stimulating all aspects of logistics that creates time and place utility in goods and service delivery (Lisitsa, Levina and Lepekhin, 2019). In fact, the backbone of the entire supply chain of the petroleum industries is the transportation management of petroleum products that makes it possible to achieve the well-known seven Rs- the right product in the right quantity and the right condition, at the right place, at the right time, for the right customer, at the right cost.

Adeleke and Ehinomen (2012) observe that not until recently, petroleum products in Nigeria were distributed all the way through a highly structured arrangement of virtually 4,000 km of pipelines interconnected to 21 extensively scattered depots in some areas around the nation. For instance, it was noted by NNPC that refined petroleum products in Nigeria are transported from the refineries through a network of pipelines, coastal (marine) vessels, road trucks and rail wagons to the 21 regional storage/distribution depots, spread across the country. For instance, in addition to pipeline distribution of petroleum products, some twenty marine tankers are employed to ferry large quantity of highly demanded products from the coastal refineries of Warri and Port Harcourt to Lagos state (Adeleke and Ehinomen, 2012); while at the same time trailers and tankers move large quantity of petroleum products across roads within the country. These conditions have usually resulted into inefficiencies in the downstream of the petroleum sectors in Niger Delta, Nigeria. Aminu and Olawore (2014) attributes refined petroleum scarcity and shortages to inefficient resource management such as low refining output, lack of pipeline infrastructure, road bridging inadequacies, and pipeline vandalism.

Identified peculiar challenges are usually associated with storage (warehousing), transportation, lead time, supplier relationship etc. Inefficiencies from points of refining to points or locations where they are required include but not limited to: excessive freight cost, traffic delays, slow movements and en-route breakdowns as well as sabotage, theft or robbery attacks (Obasanjo and Nwankwo, 2014). All these affect petroleum distribution performances and these are key elements of effective supply chain management of downstream petroleum distribution in Niger Delta region, Nigeria. Raw material extraction or productions are elements of the supply chain considered to be upstream. The upstream companies identify oil and natural gas deposits and engage in the extraction of these resources from underground (Figure 1).

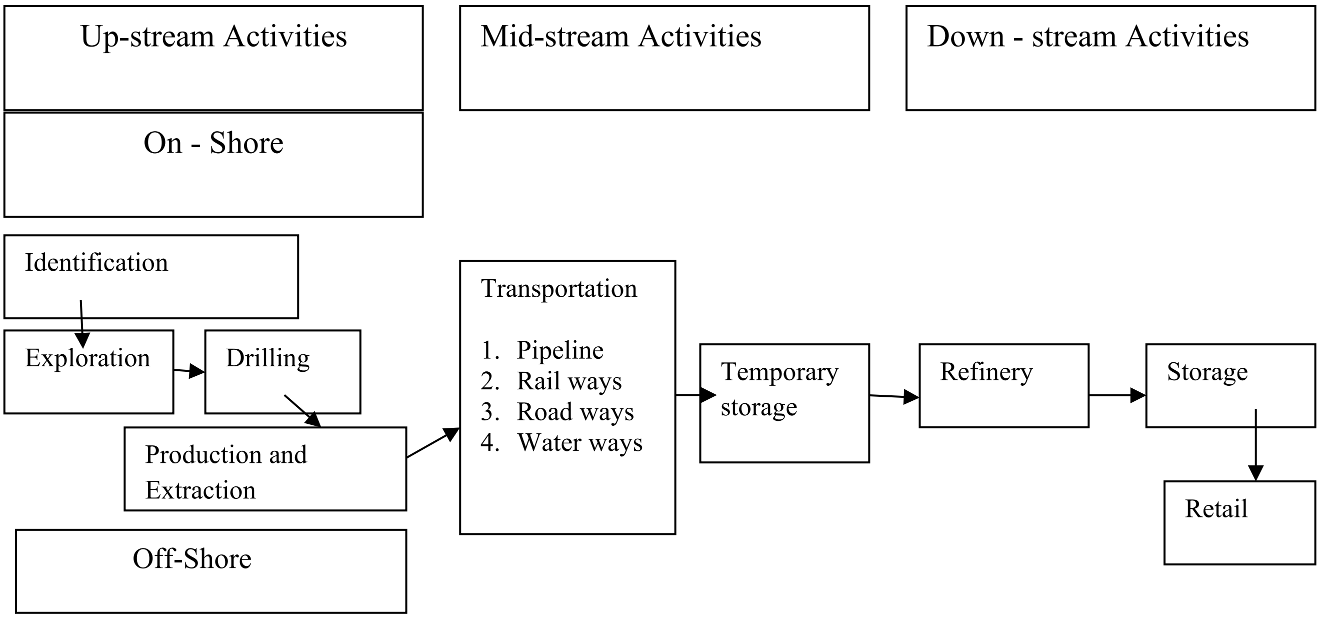

Figure 1: Various Segments of Oil Supply Chain (Adapted from Lisista et al., 2019)

The concept of supply chain management means the formation of such a sales network, in which necessary goods will be delivered to the right place at the right time with the least cost (Manzano, 2005; Chima, 2007; Lima et al., 2016; Lisista et al., 2019). The concept of supply chain management is aimed at creating optimal channels of interaction with distributors and end users. Supply-chain management is the configuration, coordination and continuous improvement of a sequentially organized set of operations. The goal of supply chain management is to provide maximum customer service at the lowest cost possible. A customer is anyone who uses the output of a process.

Features of Supply Chain Management & Logistics in the Oil Industry

Logistics is used to denote the science of transport planning, its management and control (Lisista et al., 2019). In the framework of the above process, various logistical operations related to the management of warehousing, stocks, transport, personnel are carried out. In fact, logistics is needed in order to effectively manage various material flows (Edah, 2011). Supply chain logistics software or supply chain management software (supply chain management software) is highly valuable to operational managers. The purpose of logistics platforms is to maximize customer value, while achieving a sustainable competitive advantage in the most effective ways possible. These tools support good transportation, warehousing, inventory, and logistics network design to efficiently link the flow of products, data, and finances. The oil and gas industry passes through various loads and divisions of the industry involved in the supply, transportation, storage and distribution, dealing with materials that are in three phases: gaseous, liquid and solid.

Importance of Supply Chain Management in Oil Downstream Sector

The steadily increasing global demand for oil and its derivatives such as petrochemicals has enabled companies providing these products to reach more customers and increase their market share and profitability (Hussain, 2006; Chima 2007; Lisista et al., 2019). In fact, the oil and petrochemical industry's insight into the supply chain is still in its infancy (Edah, 2011). Therefore, the main challenge facing the oil and gas industry is not the availability of oil and gas resources, but putting these reserves into production and delivering the final products to consumers at the minimum cost possible. Thus, a solid supply-chain management program will enhance this goal (Chima, 2007); because of the oil industry is global, such commodities as oil, gas, and petrochemicals require specific modes of transportation such as pipe-lines, vessels or tankers, and railroads.

Nigerian Petroleum Supply Chain: Risks & Strategies

The petroleum industry consists of the upstream sector, the midstream sector, and the downstream section (NNPC, 2016; Osuala, 2013). The upstream handles exploitation, exploration, and production of crude oil. The supply chain activity starts at the upstream (Osuala, 2013; NNPC, 2016). Crude oil is located and produced from wells, either onshore or offshore. Explorers transport crude oil from the production site to export terminals via pipelines, where export takes place. In Nigeria, distribution for local consumption takes place via pipelines, and road tankers through bridging to depots (Anifowose et al., 2014).

Risks

Petroleum supply chain operation is associated with high uncertainty and risk (Ambulkar, Blackhurst, & Cantor, 2015). Thus, because of the unique features of the petroleum supply chain, risk abounds in (a) geological operations and production; (b) market risk; (c) technological risk;

(d) price volatility risk; (e) socio-political risk; and (f) environmental and community risk. Supply risk management is a systematic approach to identifying and addressing diverse type of risk such as natural catastrophes, demand risk, equipment failure, terrorism and war (Urciuoli et al., 2014). Crisis in the Niger Delta region negatively affects crude production, which threatens both the Nigerian energy security and the global petroleum market (Enuoh and Inyang, 2014; Ijaiya, 2014).

Strategies

Oladepo (2014) recommended the deregulation and privatization of Nigerian oil and gas sector for steady supply of petroleum products to enhance national sustainable development. The Nigerian government expectation of the deregulation of the downstream supply industry was that of an efficient and effective utilization of scarce economic resources to enact free forces of demand and supply (Chigbu et al., 2016). To mitigate short supplies of petroleum products, Aminu and Olayinka (2014) recommended strategies for fuel conservation. The strategies include increase utilization rate of public transport, improve vehicle fuel economy, encourage walking and cycling, introduce high parking fees, increasing car-pooling and car sharing activities. In addition, Chigbu et al. (2016) recommended fixing the existing dilapidated and building new refineries to enhance petroleum products sustainability.

Transportation Management

Distribution of petroleum product begins at the refineries' where refined products are transported from one facility to another and ultimately to the consumer. Transportation management is essential for these activities as a large number of refineries in the world are actually located far from the market making transportation an important aspect of products distribution (Obasanjo, Francis & Williams, 2014). Modes of transportation of petroleum products from the refineries to secondary storage facilities include: pipelines, road transportation, water transportation and rail transportation.

Pipelines are most suited for transporting liquid substances and hence widely used in the petroleum industry (Ehinomen & Adeleke, 2012). While road transportation is a fast and effective means to distribute petroleum products and complements pipeline transportation, however, it can be comparatively expensive (Agusto, 2013). It is also prone to disruptions since road transportation is usually outsourced to third parties which may belong to different trade unions and therefore susceptible to embarking on industrial strikes (Agusto, 2013). Water transportation is usually used for transporting large quantities of products.

Challenges of Supply Chain in the Petroleum Industry

Supply chains are generally characterized by variability in the flow of goods through a complex series of plants, warehouses, distribution centers and multiple modes of transportation (Otieno, Ondiek & Odera, 2012). There are two major challenges facing supply chains: the complexity of the supply chain and variability of supply. According to Van der Merwe (2006), the complexity arises from the ways the three primary flows in a supply chain relate to one another. For example, orders and shipments being grouped together to achieve economies of scale in purchasing, in addition to reducing the cost of transportation, leads to supply chains being linked in complex ways.

Challenges in Nigeria

There are various challenges confronting the downstream petroleum sector in Nigeria. According to the report by the country's Petroleum Products Pricing Regulatory Agency (PPPRA) (2007), challenges of downstream sector include:

- Monopolistic practices in the sector
- Price distortion
- Inappropriate pricing of petroleum products
- Low investment in the downstream sector
- Low capacity utilization of refineries and logistical facilities
- Poor maintenance of operational facilities
- Non-competitiveness nature of the downstream business
- Barrier to full implementation of the deregulation process
- Barriers to implementation of Open Access/Common Carrier regime for logistic facilities

Materials and Methods

Study Area

The Niger Delta belongs to the South-east, South-west and south-south region of Nigeria. It is located between latitudes 5º 00'N and 6º 30'N and longitudes 5º 20'E and 9º 00'E (Figure 2). The Niger Delta is characterized with the Niger River and it is sitting directly on the Gulf of Guinea on the Atlantic Ocean in Nigeria. The Niger Delta is a very densely populated region and the southern part of the region is sometimes called the Oil Rivers because it was once a major producer of palm oil. The National Population Commission (NPC), (2006) as cited by the Federal Republic of

Nigeria (FRN) data, (2012), described population figures of states in the Niger Delta has been on the steady increase due to the influx of oil multinationals into the region.

The study area features a tropical monsoon climate, designated by the Köppen climate classification as "Am", and it is mostly found in the southern part of the country. The tropical monsoon climate has a very small temperature range. Then temperature ranges are almost constant throughout the year. For example, Warri town in the southern part of Nigeria, records a maximum of 28 °C (82.4 °F) for its hottest month while its lowest temperature is 26 °C (78.8 °F) in its coldest month. The temperature difference of Warri town is not more than 2 °C (5 °F). The Niger Delta region of Nigeria experiences heavy and abundant rainfall. The vegetation of the study area consists mainly of forest swamps. The forests are of two types, nearest the sea is a belt of saline/brackish Mangrove swamp separated from the sea by sand beach ridges within the mangrove swamp. Numerous sandy islands occur with fresh water vegetation.

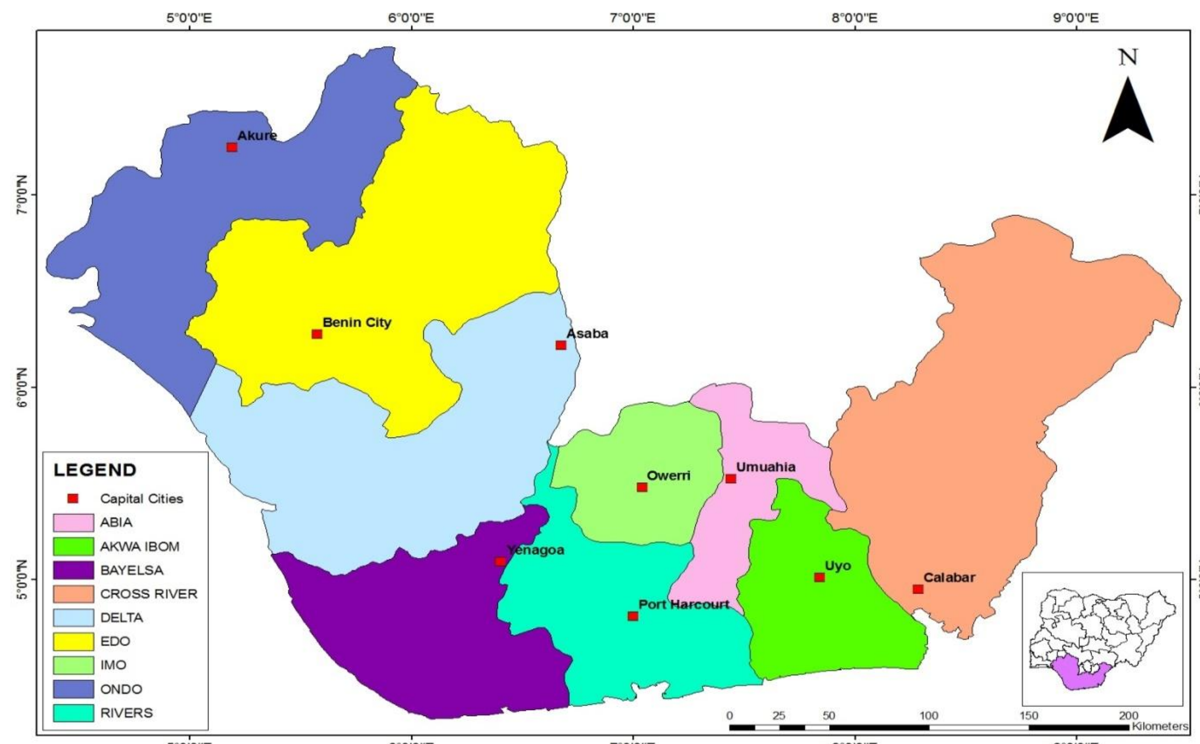

Figure 2: Niger Delta Map with Capital cities

Source: Ministry of Niger Delta Development Commission

Sample and Sampling Techniques

A sample is the representation of the population. That is, a subset of the population that is useful for obtaining data from a set of respondents which is taken as the population of the study. Thus, a sample size for the study was determined from the population figure of 6,621 because of the difficulty in studying the whole population. In other words, the sample size was determined from the staff strength of the downstream sector of the Supply Chain Management (SCM) and that of the Petroleum Product Marketing Company (PPMC) as subsidiaries of NNPC. Therefore, in order to determine a sample size for the study from the population of 6,621 (all staffs of the SCM and PPMC) the Taro Yamane (1967) formula was employed. Using the formula by substituting 6,621 in the Equation 3.1**;** the sample size obtained was 377.2112234. This figure was approximated to 378 staffs sampled for the study. The sample size for the study is 378 respondents (see details on Table 1).

Table 1: Details of Respective Staff Strengths, Total Copies of Questionnaire administered and retrieved for the study

NNPC Staffs Levels	Respective Management Roles under NNPC*	Staff Strength*	Staff Strength SCM/PPMC*	Total Copies of Questionnaire administered	Total Copies retrieved for the study
Top Management Cadre Officers	Managing Directors	25	10	5	2
	General Management Roles	36	10	5	3
	Supervisors	45	20	10	5
Middle Level Officers	Operations (Storage/Logistics administrators)	126	70	50	37
	Business Units (Budgeting/Planning Officers)	98	50	40	29
	Research & development	142	45	38	31
Low Cadre Officers	Monitoring officers	230	130	90	76
	Personnel Officers	177	107	70	61

	Grade Levels/Training levels	261	104	70	63
		1,140	546	378**	307

*NNPC (2021); **Sample size for the study

Data Analysis

Descriptive and inferential statistics were employed for data presentation and analysis. The data collected from samples of administered questionnaire were coded and the results generated and presented in Frequencies, Percentages, Tables and Charts for clarity purposes. The stated hypotheses 1, 2 and 3 were tested using the Analysis of Variance (ANOVA) statistical tool. The ANOVA statistical tool is employed when there is need to show the difference and variation between, within and among samples of interest especially when certain criteria as been met (Equ. I).

The stated hypothesis 4 for the study was tested using the Student T-test. The Student T-test is also a good measure for testing the difference between two variables (Equ. II). All statistical analysis were performed using the Statistical Package for Social Scientist (SPSS) 24.0 and Excel worksheet 2010.

ANOVA Equation is presented thus**:**

TSS = $\sum X^2 - \left(\frac{\sum X^2}{N}\right)^2$ ....(3.4)

BSS= $\frac{\left(\sum X_1\right)^2}{n_1} + \frac{\left(\sum X2\right)^2}{n2} + \frac{\left(\sum X_3\right)^2}{n_3} + \frac{\left(\sum X_4\right)^2}{n_4} \frac{\left(\sum X_5\right)^2}{n_{51}} + \frac{\left(\sum X_6\right)^2}{n_6} - \frac{\left(\sum X\right)^2}{N}$ …….. (Equ. I)

WSS = TSS – BSS ……………………………………………..

Where TSS = Total Sum of squares

BSS = Between sample sum of squares

WSS= within sample sum of squares.

Student's T-test statistics is presented thus:

$$t = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{S_1{}^2}{N_1} + \frac{S_2{}^2}{N_2}}}$$

…………………………………………… (Equ. II)

$t =$ Student's t-test

$\chi =$ mean of samples 1 and 2

$s =$ standard deviation of samples 1 and 2

$N =$ number of samples 1 and 2

Results and Discussion

Supply Chain and Logistics Operations of Refineries

The series of events surrounding the supply chain and logistics operations of downstream petroleum product distribution at the refineries was examined. The focus was to understand the features of the supply chain of sampled refinery companies using the major elements of SCM. This will expose the challenges refining companies are currently facing as well as the necessity for implementing adequate SCM practices for optimal results and efficiency. The elements of SCM used are sourcing, marketing, transportation and distribution, and the supplier relationship effects (SMTDS).

Challenges regarding Sourcing as an aspects of Supply Chain Management (SCM)

The information for Sourcing as one of the elements of measuring effective SCM and Logistics is displayed on Figure 3. It was revealed that 72.0% of sampled respondents indicated that there is need for improvement in their SCM and logistic operations in the last 5 years. The study showed that 38.1% of respondents in the PHRC and 33.9% respondents in the WRPC agreed that their SCM and logistics operations in the last 5 years need to be improved. Thus, improvement in the SCM and logistics operations will mean a well laid out plan that allows for proper and efficient coordination of the movement of products in a timely fashion which is safe and effective. It was revealed that 74.2% of respondents agreed to this with 39.7% of the total from the PHRC and another 34.5% from the WRPC. This means that the knowledge for real time assessments in effective supply chain management of petroleum products is inadequate. Real time knowledge in supply chain management is useful for better collaboration, improved quality control and service, higher efficiency rate amongst others.

The study also discovered that there is low number of experienced personnel required to assist in the sourcing aspect of SCM for efficient petroleum distribution in the study area. It was revealed that 60.0% of sampled respondents agreed to this with 35.8% of them from the PHRC and another 24.2% from the WRPC. More experienced managers and experts in this sector will mean quality improvement in all stages of SCM as regards petroleum product distribution in the study area.

The study further revealed that 73.6% of sampled respondents indicated that the strategies for monitoring the activities regarding SCM and logistics operations are inadequate. It was revealed that 40.7% from PHRC and 32.9% from the WRPC agreed that the strategies for monitoring logistical operations are inadequate. Monitoring facilities and strategies are important tools and techniques that can facilitate development and improve overall performance of oil marketing business companies.

Lastly, as regards sourcing, the study discovered that low feedbacks on challenges that will help to improve performance were low and this was indicated by 77.6% of sampled respondents. In other words, 38.5% of respondents from the PHRC and 39.1% of respondents from the WRPC agreed to the fact that their industries have been experiencing low feedbacks information that will have helped to improve their performances overtime.

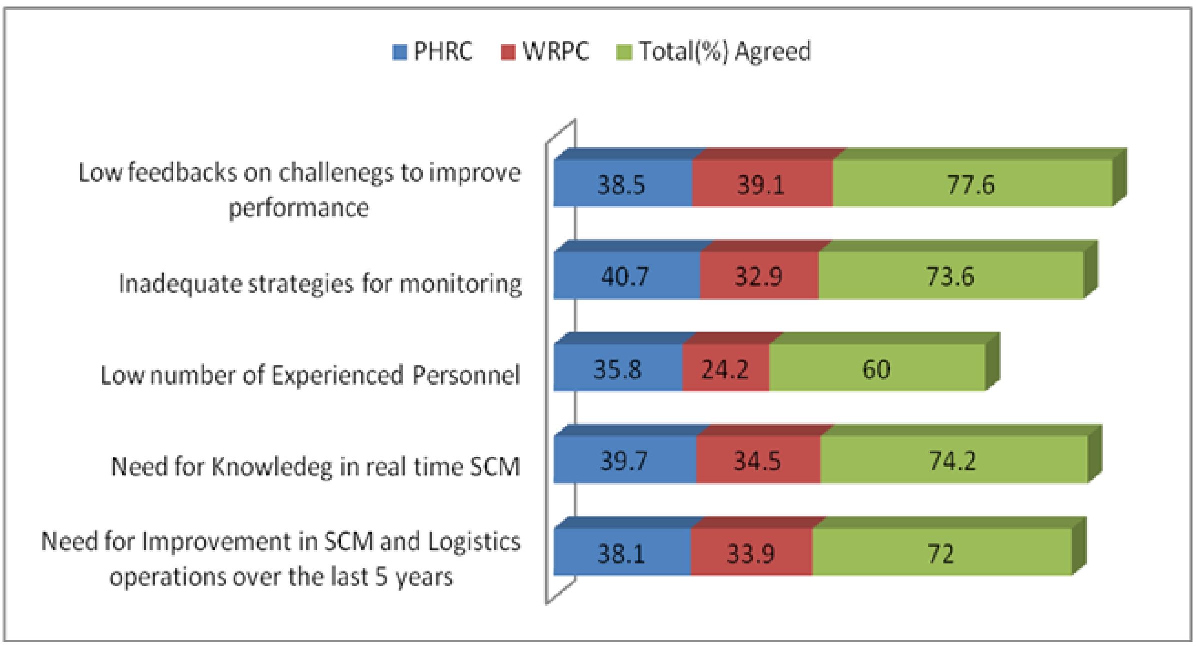

Figure 3: Challenges affecting SOURCING arm of SCM in Refineries

Transportation and Distribution arm of SCM

Level of Effectiveness of Product Transportation

The information for the status of transportation and distribution of products to consumers is displayed on Table 2. The distribution revealed that 67.0% of respondents indicated poor; 26.4% of respondents indicated moderate; 4.6% of respondents indicated effective while the remaining

2.0% of respondents viewed it as very effective. Thus, the study concluded that the transportation and distribution of petroleum products to consumers have been poor overtime. Consequently, continual promotion of logistics development level and other aspects which ensure effective transportation of product to consumers are strategies geared toward an efficient SCM system for downstream petroleum products.

Table 2: How effective is product transportation to consumers

	Responses				
Refineries	Very effective	Effective	Moderate	Poor	Total
PHRC	3	7	46	115	171
	1.0%	2.3%	15.0%	37.5%	55.7%
WRPC	3	7	35	91	136
	1.0%	2.3%	11.4%	29.6%	44.3%
Total	6	14	81	206	307
	2.0%	4.6%	26.4%	67.1%	100.0%

Reverse Logistics

The information for the status of reverse logistics in refining companies is displayed on Table 3. The distribution revealed that 32.6% of respondents indicated poor; 51.4% of respondents indicated moderate; while the remaining 16.0% of respondents indicated effective. The study concluded that the level of reverse logistics to improve the distribution of petroleum products has been moderate overtime. Normally, ensuring that the quality of product is maintained till the end of its logistic operation allows for reverse logistics.

Lead Time

The information shows the status of 'lead time' in sampled refining companies. The distribution revealed that 14.3% of respondents indicated poor; 59.6% of respondents indicated moderate; 17.6% of respondents indicated that it is effective; while the remaining 8.5% of respondents indicated very effective. The study concluded that the level of effectiveness of 'lead time' to improve the distribution of petroleum products has been moderate overtime.

Order Lead Time, Order handling, Processing Lead Time and Delivery Time

The information displayed the status of 'order lead time', order handling, processing lead time and delivery time as regards product transportation of sampled refining companies. The distribution revealed that 31.9% of respondents indicated it to be poor; 52.8% of respondents indicated it to be moderate; while the remaining 17.6% indicated it to be effective. The study concluded that this aspect of product transportation and distribution have moderate ratings overtime. The constant assessment of Order 'Lead time', Order 'Handling', Processing 'Lead time' and Delivery 'Lead time' are constantly measured to aid product supply chain management. These activities are geared toward improving performance as regards the supply and distribution of petroleum products.

Table 3: Level of effect of Companies Reverse Logistics

	Responses			
Refineries	Effective	Moderate	Poor	Total
PHRC	27	83	61	171
	8.8%	27.0%	19.9%	55.7%
WRPC	22	75	39	136
	7.2%	24.4%	12.7%	44.3%
Total	49	158	100	307
	16.0%	51.4%	32.6%	100.0%

Conclusions and Recommendations

The study raised several issues that were affecting the roles and responsibilities of the SCM and PPMC subsidiaries of NNPC; whose main role and responsibility are to ensure the effective supply and distribution of PMS in Niger Delta and nationwide. However, several challenges were identified as hampering their performances overtime which were basically directed at poor capacities which are currently hindering the refineries practices over the application of efficient supply chain management (SCM) systems. Thus, the following recommendations were put forward to address these problems; and these are: The challenges affecting efficient supply chain management of the downstream petroleum companies can be resolved and mitigated when these industries seek better ways of improving performances by constantly promoting value creation; employing the right leadership individuals in sensitive and strategic positions not by sentiments; constantly employing the use of skilled, transparent and efficient workers; and also ensuring training, re-training of workers either quarterly or yearly in order to develop and improve the workforce and their performances overtime. By constantly boosting supply chain performances in the lifecycle process of supply chain management will help eradicate poor storage management, improve inventory, minimize delays, reduce operating costs; promote better relationship with other actors and suppliers and in all increase efficiency at all times.

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CONVERGENCE AND DIVERGENCE: EXAMINING THE IMPACT OF MASS MIGRATION ON CULTURAL DYNAMICS WITHIN THE EUROPEAN UNION

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Abstract

The study analysed the cultural dynamics of mass migration inside the European Union (EU) and its consequences for both host and immigrant populations. The arrival of the unprecedented number of migrants from Africa and the Middle East has raised concerns over cultural clash in the region. This clash is mostly between the Christian European nationals and Islamic migrants. The study investigated the impact of policies, perspectives of host communities, characteristics of migrants, and geopolitical factors to understand the intricate interactions of cultural exchanges inside the European Union. The 2020 Greek Turkish border engineered migration crisis pushed that the arrival of migrants for a particular cultural background can lead to cultural clash, insecurity, and marginalization. The study adopted descriptive and historical research designs, data were drawn from secondary sources and were analysed using content analysis technique. The study used Samuel Huntington's theory of clash of civilization to deepen the understanding of the subject matter. The results of the study challenged the binary oppositions proposed by Huntington's "Clash of Civilizations" theory, revealing a more complex understanding of cultural interchange, adaptation, and conflict. The study contributes to the field by highlighting the need for inclusive policies and public discussions that acknowledge the many consequences of migration. Furthermore, it highlights the potential for cultural enhancement with the challenges linked to integration. The study's findings revealed that cultural conflicts and opportunities for positive cultural interactions coexist, perhaps resulting in more diverse and unified civilizations. The recommendations include improving integration policies, promoting intercultural dialogue, addressing populism and intolerance, and allocating resources to study and data collecting.

Keywords: Mass migration, Cultural Clash, Populism.

Introduction

The European Union (EU) has taken a leading role in tackling the challenges posed by large-scale migration, which has become a defining concern of the early twenty-first century. The influx of migrants, although not a novel phenomenon, has surged to unprecedented proportions in recent years, underscoring the intricate dynamics between security challenges, human rights considerations, and the socio-political structure of the European Union. The phenomenon of mass migration in Europe is closely intertwined with significant issues such as globalisation, security, human rights, and the surge of populism. These factors all contribute to the ongoing cultural conflict inside the Union.

The European Union has implemented a broad approach to address mass migration, focusing on humanitarian and institutional initiatives to discourage illegal migration and provide a unified response framework. In his analysis, Lipold (2023) conducted a thorough assessment of the European Union's security measures in response to mass migration. His findings highlighted the absence of a well-structured strategy and underscored the absence of agreement among member states about a unified migration policy. The absence of agreement suggests underlying ideological differences and the challenges of reconciling national interests with collective European Union initiatives (Lipold, 2023).

The events that occurred in 2020 at the Greek-Turkish border highlighted the significant difficulties posed by large-scale migration. In their publication, Şleyen and Karada (2023) provided a detailed description of the migrant crisis, highlighting how Turkey's choice to allow entry over its borders resulted in a complex situation with both humanitarian and security implications. The act of 'engineered migration' was not only a strategic manoeuvre in the geopolitical landscape, but also a deliberate action that questioned the EU's border security procedures and its position on migration (şleyen & Karada, 2023). The events at the border, marked by acts of aggression and the establishment of a zone dedicated to humanitarian aid, brought attention to the European Union's difficulties in effectively controlling its external borders and internal disagreements on the management of the increasing number of migrants.

The human rights implications of the migratory policies of the European Union have also sparked much controversy. Pijnenburg (2023) examined the degree to which EU Member States are bound under the International Covenant on Economic, Social, and Cultural Rights to individuals who are resident in other countries due to migration arrangements. Pijnenburg's (2023) research illuminates the socioeconomic rights of migrants, who often reside in abhorrent circumstances and without access to vital facilities. It also raises doubts about the legality and ethicality of the EU's extraterritorial methods of controlling migration. Consequently, these agreements provide that the rights of migrants are confined inside third countries. The implementation of EU policies for migrants' living conditions may exacerbate cultural tensions and highlight disparities between the rights afforded to EU residents and those accessible to migrants (Pijnenburg, 2023).

Populism has played a pivotal role in shaping the EU's discussion on cultural conflict. The rise of populist parties has been linked to an increasing lack of faith in established political parties, as well as its perceived inability to effectively handle the cultural impacts of migration. Burdiuh (2023) investigates the correlation between populist activity and internal structural transformations inside EU countries, such as the emergence of illiberal democracy and the evolving dynamics between politicians and citizens. Populist parties often use cultural conflicts to incite anti-immigrant, anti-European, and nationalist sentiments (Burdiuh, 2023). Gaining insight into the cultural conflict that arises from mass migration is crucial for promoting social harmony and implementing inclusive policies that respect cultural diversity while facilitating the integration of migrants into European Union communities. The resolution of the cultural clash requires more than just security measures. It requires a comprehensive strategy that tackles the root causes of migration, protects the rights of migrants, and fosters communication and mutual understanding across different cultural groups. The EU has been grappling with a persistent mass migration crisis, leading to a multitude of socio-political challenges, including cultural clashes between migrants and host communities. The subject is presented in a comprehensive manner within this framework, encompassing the necessity to address the immediate problems posed by mass migration, while also considering the long-term consequences for social cohesion and integration within the European Union.

Statement of the Problem

The arrival of the unprecedented number of migrants from Africa and the Middle East has raised concerns over cultural clash in the region. This clash is mostly between the Christian European nationals and Islamic migrants. These two religions are embedded in two parallel cultures that have opposed each other for a very long time. Recall that the EU member states pride themselves to be the custodians and protectors of the Christian heritage while the Middle East and some parts of Africa remain the centres for Islamic affairs. The mobility of Muslim migrants into the EU with western culture has experienced cultural resistance from the host nations and their nationals in what they consider to be the preservation of their cultural purity and sanctity.

The influx of migrants entering the European Union has surged in recent years due to a confluence of reasons including armed conflict, economic disparities, and climatic change. The demographic changes that have occurred consequently have emphasised the significance of enacting efficient security protocols that uphold human rights and facilitate the integration of migrants. Lipold (2023) emphasised the European Union's incapacity to formulate a unified and effective approach in addressing this issue, specifically pointing out the absence of a well-defined security policy to manage the significant influx of illegal migrants. The absence of consensus among European Union member states about a unified migration strategy highlights underlying differences and emphasises the difficulty in achieving a fair and equitable approach that upholds the sovereignty of individual member states while also considering the collective interests of the Union (Lipold, 2023). The engineered migration event orchestrated by Turkey in 2020 exemplifies the gravity of the issue. According to şleyen and Karada (2023), this event is seen as a deliberate act of 'engineered migration,' which not only questions the EU's border security but also its ethical and legal obligations towards migrants. This episode revealed the harsh truth of how migration may be manipulated as a political tool, causing harm to both the EU's relationships with other countries and its internal unity (şleyen & Karada, 2023). Moreover, the cultural clash that is typical in situations of large-scale migration extends beyond immediate issues related to humanitarian aid and security to encompass more profound concerns of socioeconomic rights. Pijnenburg (2023) examined the obligations of EU Member States with the International Covenant on Economic, Social, and Cultural Rights, highlighting the adverse effects of migratory agreements on the socioeconomic rights of migrants. The consequences that arise from such agreements sometimes expose migrants to precarious circumstances, depriving them of essential services and causing challenges in their integration, hence exacerbating cultural disputes (Pijnenburg, 2023).

The proliferation of populism inside the European Union further exacerbates the cultural divide since populist parties often use immigration difficulties to gain political influence. Burdiuh (2023) investigated the correlation between the rise of populism and the challenges faced by the EU in managing migration. The study revealed that the growth of populist movements may be attributed to a combination of declining faith in established political parties and structural transformations within EU societies. This activity often manifests as the use of language that opposes immigration, European integration, and promotes nationalism. Such language has the potential to worsen cultural conflicts and hinder the development of efficient migration policies (Burdiuh, 2023). Hence, the matter at hand encompasses not only the management of migration flows and border security, but also the assimilation of migrants into EU cultures with the aim of reducing cultural incompatibilities and fostering social cohesion. The EU must adopt a holistic approach to tackle this problem, which entails addressing both immediate security and humanitarian requirements, as well as providing support for long-term integration strategies that uphold the cultural identities of both migrants and host cultures.

When formulating a problem statement, it is crucial to acknowledge that the cultural conflict resulting from large-scale migration is indicative of broader structural issues within the European Union, including difficulties in governance, fragmented policies, and the necessity for solidarity among member states. The EU's capacity to efficiently handle this crisis will depend on its readiness to participate in transparent discussions regarding these challenges, revise its policies in response to evolving global dynamics, and uphold its dedication to the principles of human rights and dignity for all individuals, irrespective of their origin.

Aim and Objectives

The aim of this study is to critically examine the influence of mass migration on cultural dynamics inside the European Union, as well as the scope and character of cultural disputes. In order to attain its goal, this study will be supported by two objectives. They are to;

1) Identify and analyse patterns and perceptions of cultural clash
2) Assess the effectiveness of existing EU migration and integration policies

Research Questions

The research aims to answer two questions:

1) What are the prevalent patterns of cultural conflict between migrants and host communities within the European Union?

2) How do the present EU policies succeed in managing cultural integration and minimising the consequences of cultural conflict?

Theoretical Framework

The study adopts the theory of clash of civilisation put forward by Samuel Huntington as its theoretical framework. In his influential work, Samuel Huntington proposed the notion of the clash of civilizations, which argues that cultural differences, rather than ideological or economic factors, will be the main source of conflict in the post-Cold War era (Huntington, 1993). According to Huntington's theory, the areas of conflict in the future would occur along the divisions between different civilizations. In this context, "civilizations" refer to the largest cultural groupings that share common historical, linguistic, and religious linkages. This theory offers a good framework for examining cultural conflicts that arise from large-scale migration to the European Union (EU). Within Europe, the understanding of migration is closely linked to the idea of cultures coming into touch with one other, which may sometimes lead to violence.

Europe has an extensive history of migration, characterised by successive movements shaped by the continent's conflicts, economic progress, and political changes. In the post-World War II period, European countries saw the initial significant challenges to cultural uniformity due to the arrival of "guest workers" and subsequent settlement of their families. These challenges have been worsened by the recent and fast increase in the number of migrants from regions beyond the traditional boundaries of European culture, as described by Huntington (Huntington, 1996). The assimilation of these migrants into the culture has proven to be difficult. The policies of the European Union have often been characterised by a tendency to respond to situations rather than taking proactive measures. As a result, they have struggled to effectively address the challenges posed by the large influx of migrants and the associated cultural complexities.

The cultural clashes observed in certain EU member states might be seen as indications of the anticipated conflicts described by Huntington. Using Huntington's perspective, the engineered migration crisis at the Greek-Turkish border in 2020 might be seen as a clash between Islamic culture and the Western world (şleyen & Karada, 2023). The occurrence of violence and the creation of a humanitarian zone at the border underscore the tensions that arise when different civilizations interact closely in stressed and competitive circumstances. Pijnenburg's (2023) study on migrants' socioeconomic rights highlights the challenges associated with assimilating individuals from other cultures into Europe's legal and social structure. The EU's migration agreements with third countries have faced criticism for potentially compromising the socioeconomic rights of migrants. This suggests a conflict between the universal principles of human rights and the specific cultural and political interests of EU member states (Pijnenburg, 2023).

The rise of populism inside the European Union may also be observed from the perspective of Huntington's theory. Populist groups sometimes exploit a feeling of civilizational identity, presenting their anti-immigrant views to protect European culture from perceived threats posed by non-European civilizations. This phenomenon is particularly evident in the political discourse surrounding migration, as populist politicians employ rhetoric centred on the preservation of cultural identity and the maintenance of a pure culture (Burdiuh, 2023). Despite being a subject of controversy Huntington's thesis offers a structured approach to examining the profound and intense cultural conflicts that occur prior to large migration. This suggests that these disputes are deeply rooted in basic cultural disparities that are hard to overcome.

Nevertheless, it is crucial to acknowledge the detractors of Huntington, who argue that his theory oversimplifies the origins of conflict and disregards the potential for cross-cultural convergence and blending of civilizations (Said, 2001). When applying Huntington's theory to the European setting, it is crucial to carefully assess both the valuable insights it offers and its inherent limits. The EU's encounter with migration and cultural integration exemplifies the intricacies of contemporary inter-civilizational interaction. This statement calls on governments, researchers, and individuals to create strategies for managing cultural diversity that surpass the simplistic divisions suggested by the clash of civilizations paradigm. Instead, it is necessary to implement laws and practices that acknowledge the movement and interaction of different civilizations, as well as the common human values that might bridge the gaps between them.

Historical Perspective on Migration and Cultural Integration in Europe

The historical subjects of migration and cultural integration have significantly impacted Europe, resulting in notable changes to the continent's demographic, social, and political environments. The history of migration to Europe is a complex tapestry of narratives, each influenced by the condition of time and place. Europe has historically seen significant human mobility due to various factors such as post-World War II labour shortages, the collapse of the Iron Curtain, and more recently refugee movements from the Middle East and North Africa (Castles, de Haas, & Miller, 2014). After World War II, Europe faced a paradoxical situation: extensive areas were destroyed, yet economic reconstruction, supported by the Marshall Plan and the ensuing economic upturn, created a need for labour that the native population alone could not provide. Consequently, the recruitment of individuals known as "guest workers" from southern Europe, subsequently extending to Turkey and North Africa, took place. Once their labour became unnecessary, these workers were expected to go back to their home countries. However, a significant number of them chose to stay permanently, laying the foundation for a diverse and multicultural society (Castles et al., 2014). The transition from the twentieth century to the twenty-first century brought about a change in migration to Europe.

Again, the dissolution of the Soviet Union and the enlargement of the European Union (EU) facilitated a new influx of migration from east to west, while conflicts in the Middle East and Africa led to significant refugee migrations towards Europe. The EU's enlargement towards the east presented new member states with prospects of economic growth, but also raised concerns over the influx of migrants and their assimilation into the wider EU structure (Favell, 2008). The current surge in migration to Europe has been characterised by a confluence of voluntary economic migration, coerced displacement due to conflict and persecution, and the mobility of individuals in search of better opportunities for themselves and their families. The influx of large-scale and heterogeneous migrant flows has placed considerable pressure on the migration and asylum systems of the European Union, revealing the deficiencies of current frameworks in addressing this issue (Triandafyllidou, 2014).

The issue of cultural integration has been a significant challenge, with diverse strategies and achievements observed throughout various European nations. Cultural conflicts have emerged as a prominent subject of political discourse and public affairs, often stemming from divergent religious practices, social norms, and principles. The European Union's challenge in achieving cultural integration extends beyond the mere management of variety. It also involves addressing the lasting effects of colonialism, xenophobia, and the rise of nationalist sentiments (Vertovec, 2010). Şleyen and Karada (2023) argued that the engineered migrant crisis that occurred at the Greek-Turkish border in 2020 serves as a contemporary reflection of longstanding conflicts between efforts to regulate migration and the protection of human rights. The broadcast highlighted the deliberate use of migration as a political tool, as well as the potential humanitarian disasters that may arise when large populations are manipulated as pawns in geopolitical conflicts. Pijnenburg (2023) examined the persistent concern over the socioeconomic rights of migrants, particularly in relation to the impact of the EU's migration treaties on their rights and well-being, which has often been subject to criticism. The challenge is in finding a harmonious equilibrium between the necessity for border control and security, and the imperative to provide migrants with opportunities for protection and integration (Pijnenburg, 2023). Populism has been a significant factor in shaping discussions on migration and cultural integration. Burdiuh (2023) posits that the proliferation of populist parties throughout Europe has been driven by economic instability, concerns about security, and cultural unease, leading to a political environment that is generally unwelcoming towards migrants. Populist rhetoric can worsen tensions and hinder the implementation of inclusive policies, making cultural integration even more challenging (Burdiuh, 2023).

Patterns and Perceptions of Cultural Clash

The continued increasing issue of migration has triggered significant cultural changes in both countries receiving immigrants and the immigrant communities themselves. The impacts mentioned have been extensively documented via empirical study, revealing an intricate relationship between the preservation of cultural identity and the needs of assimilation and acculturation. The outcomes of mass migration are not consistent; they differ significantly based on the context and demographic groups involved, but specific trends have emerged that provide light on the wider implications of these migrations. Studies indicate that mass migration has a crucial role in enhancing cultural variety within host communities. This is achieved by bringing new languages, beliefs, culinary traditions, and creative expressions, which in turn strengthens the social fabric (Vertovec, 2007). The presence of diverse individuals has the capacity to enhance the cultural vibrancy and global competitiveness of host nations by creating a more dynamic and inventive atmosphere. Nevertheless, the influx of other cultures presents challenges, especially regarding the assimilation of immigrants and the reception by the native population. The integration process is influenced by several elements such as government policies, social attitudes, and the available resources to support migrants (Castles, de Haas, & Miller, 2014).

The cultural influence on immigrant communities is quite significant. Migrants commonly undergo a twofold process of cultural metamorphosis as they navigate their identity between the culture of their home country and that of the host society. This negotiation can lead to many results, which can range from embracing a bicultural identity to forming distinct ethnic enclaves that maintain strong connections to the original culture (Berry, 2005). The amount to which immigrants assimilate into the host culture is influenced by several aspects at both the individual and societal levels. These elements include the reasons for moving, the level of community support, and the host society's sensitivity to cultural variations (Portes & Rumbaut, 2006). The literature also emphasises the potential occurrence of cultural collision when the values and traditions of immigrant cultures conflict with those of the host society. These conflicts can arise in several domains, including as the workplace, educational institutions, and community interactions, and can have significant implications for societal unity and the development of policies (Huntington, 1996). The engineered migration crisis at the Greek-Turkish border in 2020 exemplified the conflicts that may emerge when a substantial number of migrants abruptly enter a receiving community, challenging its ability to react and sparking discussions over national identity and security (şleyen & Karada, 2023). Migrants' socioeconomic rights also have a significant influence. Research indicates that migration agreements and rules often inadequately safeguard the rights of migrants, leading to instances where they may be denied crucial services and opportunities for economic their betterment (Pijnenburg, 2023). The lack of protections might exacerbate the susceptibility of migrant communities and lead to their marginalisation and social isolation, hence fueling cultural conflicts (Pijnenburg, 2023). Populism has been seen as a significant determinant of the cultural argument resulting from mass migration. Populist movements in Europe have been linked to growing concerns over the preservation of national culture and identity in response to perceived immigration issues (Burdiuh, 2023). Populist narratives often depict migration as a fundamental danger to the cultural coherence of the host community, resulting in the implementation of stringent legislation and an unwelcoming atmosphere for immigrants (Burdiuh, 2023). Notwithstanding, these challenges, empirical data indicates that effective assimilation of migrants may yield enduring advantages for host nations, including economic expansion, cultural revitalization, and enhanced diplomatic relationships (Castles et al., 2014). Implementing cultural exchange and mutual adaptation policies that encourage cultural engagement and adaptation can help mitigate the potential conflicts arising from cultural differences and foster the development of more inclusive communities (Portes & Rumbaut, 2006). An examination of cultural interconnections inside the European Union (EU) in the context of migration reveals a complex and multifaceted scenario. Cultural interactions are influenced by several elements, such as policies of the EU member states, perspectives of the host society, features of the migrant population, and wider geopolitical dynamics.

Empirical research has demonstrated that cultural interactions in the EU's migration context have both advantageous and adverse consequences. Research has demonstrated that cultural variety enhances creativity, economic dynamism, and the resilience of civil society (Alesina & La Ferrara, 2005). Cultural clashes, however, can arise from disparities in religious customs, societal norms, or political beliefs, which may be exacerbated by economic rivalry or social marginalisation (Huntington, 1996). The process of cultural integration is closely linked to matters of identity. Migrants often grapple with complex identity concerns, leading to the formation of hybrid identities that incorporate elements from both their original and adopted cultures (Berry, 2005). The efficacy of these identity constructs relies on the presence of robust cultural interactions and the extent to which the host society accepts diversity (Vertovec, 2007).

Now is the time to examine the issue of cultural conflicts arising from migration in the nations where migrants settle. Germany, a favoured destination for migrants, particularly during the 2015 refugee crisis, has seen cultural clashes related to issues such as integration, employment, and social welfare. Despite the country's substantial endeavours to embrace migrants and provide them with integration initiatives, challenges persist. The emergence of the right-wing political party Alternative for Germany (AfD), for instance, has been attributed partly to popular apprehensions over immigration and cultural transformation (Bustikova, 2019). France has a rich history of migration from its former colonies, which has led to a diverse population and a significant Muslim minority. Discussions in France often centre around secularism and religious expression, with particular focus on the wearing of the hijab in public spaces and the concept of "lacité," which refers to official secularism (Bowen, 2007). These problems have sometimes led to social conflicts and have been turned into political matters in discussions at the national level, especially in relation to terrorism and security worries.

In addition, Sweden is renowned for its inclusive approach towards refugees and migrants, but, this has led to challenges in terms of assimilation into society and finding jobs. Migrants often experience cultural clashes in the housing sector since they often end up living in segregated areas with limited economic opportunities. This situation leads to tensions and a feeling of alienation among migrant communities (Borevi, 2014). Again, Italy has been in the forefront of the Mediterranean migration route and has faced significant challenges in effectively handling the influx of migrants and refugees arriving by sea. Conflicts have arisen due to disagreements over how resources should be distributed, how to provide for refugees, and how to integrate migrants into the areas they settle in. The rise of the Lega Nord party, characterised by its staunch anti-immigrant stance, mirrors wider societal apprehensions over the influence of migration on Italian culture and society (Campesi, 2018).

Furthermore, Greece has acted as an additional point of entry into Europe for migrants and refugees, mainly those who are crossing from Turkey. The nation has come under significant pressure due to economic austerity measures and the large influx of migrants, resulting in strained public services and heightened cultural conflicts. The conflict between advocacy for refugee rights and resistance from local communities, as well as the consequences of migration on Greek islands that have served as crucial entry sites, have been significant concerns (Triandafyllidou, 2020). Similarly, conflicts arising from cultural differences have become apparent in discussions surrounding Dutch identity and the assimilation of Muslim communities in the Netherlands. The political impact of individuals like Geert Wilders, who has openly criticised Islam, highlights the persistent tensions within Dutch society concerning multiculturalism and the role of migrants in the country's collective story (Vasta, 2007). These instances illustrate the diverse situations in which cultural conflicts arise across the European Union. The experiences of each nation are influenced by its distinctive historical background, patterns of migration, and policy reactions, leading to an intricate milieu of cultural interaction and discord.

Policy Influences on Cultural Interactions

The policies of the European Union exert a substantial influence on the circumstances that facilitate cultural interconnections. The primary objective of the Common European Asylum System (CEAS) and the Schengen Agreement is to regulate migration while simultaneously safeguarding the rights of refugees and asylum seekers. Nevertheless, the way these restrictions are put into practice varies throughout member states, so impacting the process by which migrants assimilate into local cultures (Favell, 2008). Countries that have more inclusive policies may promote increased cultural interactions by providing language courses, integration initiatives, and anti-discrimination laws.

The receptivity of host communities is another significant aspect that influences cultural interactions. In certain situations, nationals demonstrate receptiveness and curiosity towards migrant cultures, actively engaging in cultural exchanges and fostering a welcoming atmosphere. Cultural exchanges can become tense when there is opposition or hostility towards migrants, leading to the separation and social conflict (Pijnenburg, 2023). The features of migrant groups, including their migration motivations, cultural origins, and demographic profiles, also have an impact on cultural connections. Economic migrants, family reunifications, refugees, and asylum seekers each possess distinct experiences and needs that shape their interactions with host cultures. According to Weinar and Klekowski Von Koppenfels (2020), highly skilled migrants may have a smoother integration into the labour market and social networks compared to those who join involuntarily and with few means. Geopolitical events can directly influence cultural interactions inside the EU. The Syrian refugee crisis caused by a long-lasting civil conflict led to many migrants entering the EU. This puts pressure on the existing systems for integrating refugees and caused various cultural responses from EU member states.

Discussion of Findings

An analysis of the data through the lens of Samuel Huntington's "Clash of Civilizations" theory demonstrates that, as Huntington (1996) cautioned, cultural conflicts are an inevitable consequence of extensive migration. The empirical facts obtained from the European Union, however, demonstrate a more intricate and detailed reality. Although there is evidence supporting the existence of cultural conflict, there is also data indicating cultural exchange and assimilation, which challenges Huntington's simplistic categorizations. This indicates that the theory may oversimplify the intricacies of cultural interactions in the context of migration. In comparison with previous study, it becomes evident that the European Union's experience is not exceptional. Migration, as indicated by research, results in cultural diversity, which can have advantageous or detrimental impacts on host nations (Castles, de Haas, & Miller, 2014). The results align with Berry's (2005) acculturation study, which revealed that migrants often cultivate a bicultural identity, serving as a bridge between their native culture and the new culture of the host nation. This method holds the capacity to enhance the cultural landscape of the receiving nation while also safeguarding the cultural heritage of the migrants. The importance of understanding the cultural aspects of migration is significant. The findings suggest that cultural linkages are influenced by several variables, such as policy, community perspectives, and characteristics of the migrant population. This underscores the importance of considering these factors when formulating integration policies and activities. Policies that foster cultural awareness and aid the integration of migrants can enhance positive cultural interactions and decrease the probability of conflict (Pijnenburg, 2023).

Again, the increase of populism as a reaction to migration highlights the significance of effectively controlling public communication on cultural diversity. The propagation of populist narratives that depict migration as a threat to cultural identity can exacerbate conflicts and hinder endeavours to foster integration (Burdiuh, 2023). Hence, it is imperative for governments and community leaders to actively endorse inclusive narratives that prioritise the appreciation of cultural diversity. The cultural aspects of migration are complex and multifaceted. Although the clash of civilizations theory provides a starting point for comprehending potential conflicts, practical evidence demonstrates that reality is considerably more intricate and, in numerous instances, more favourable. The EU's experience highlights the capacity for cultural enhancement, as well as the necessity for policies that foster integration and advantageous cultural interactions.

Conclusion

This study examined the intricate dynamics of large-scale migration and its cultural consequences inside the European Union (EU). The primary conclusions indicate that cultural interactions in the context of migration are shaped by a range of elements, such as national policies, societal perspectives, and characteristics of the migrant community. The results challenge the binary representation of cultural conflicts proposed by Huntington's "Clash of Civilizations" theory, instead uncovering a diverse and intricate pattern of cultural interaction, assimilation, and occasional discord. This work contributes to the area by providing a thorough comprehension of how cultural diversity, influenced by migration, influences the socio-cultural environment of the European Union. This highlights the importance of policy frameworks that encourage positive cultural exchanges and the integration of migrants into their home nations. Moreover, it underscores the significance of public dialogue that fosters an equitable perspective on migration, recognising both the difficulties and advantages it presents.

Migration will continue to be a significant factor in shaping the future of the EU's socio-cultural landscape. The findings indicate that effective integration can have a positive impact on economic growth, cultural enrichment, and social cohesion. Nevertheless, the potential for cultural conflicts must be addressed by well-informed policy development and active involvement of the community. Conclusively, the European Union has difficulties in effectively handling cultural variety. However, there is also significant potential for constructing inclusive communities that reap the advantages of migrants' contributions. The purpose of this study is to provide information for policy choices and advocate for a comprehensive strategy to comprehending and handling the cultural aspects of migration in the European Union.

Recommendations

The following recommendations are made based on the findings and conclusions of the study on mass migration and cultural tensions inside the European Union:

1. EU member states should enhance their integration policies to facilitate the effective integration of migrants into host society. This may entail providing language and vocational instruction to migrants and host communities, promoting access to education and employment prospects, and offering cultural orientation initiatives.
2. It is important to actively promote intercultural talk and foster mutual understanding. Initiatives may include community-building activities that foster connections between migrants and host community members, public campaigns aimed at raising awareness of the advantages of cultural variety, and platforms that enable migrants to share their experiences and contributions with the wider society.
3. It is imperative for EU institutions and member states to collaborate to counteract the harmful consequences of populism and xenophobia. This objective may be achieved by means of education, public debate, and active involvement in the media that challenges preconceived notions about migration and highlights the advantages of a multicultural society.
4. Additional investment is necessary to acquire information that may guide policy decisions and shape public sentiment. This includes the undertaking of extensive research on the impacts of migration, evaluating the effectiveness of integration programmes, and gathering data on the economic and social contributions of migrants. Enhanced statistical

analysis can result in improved decision-making and a deeper understanding of the intricate dynamics of migration and cultural assimilation.

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Mass Migration in the EU: Assessing Germany's Dominant Role and Its Impact on Member States

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Abstract

The European Union (EU) has had substantial difficulties in effectively handling large-scale migration, with Germany assuming a crucial role in formulating the bloc's migration policy. This study investigated the economic and political dominance of Germany inside the EU and how it affects the EU's stance on migration. The research examined the relationship between German interests and the wider migratory dynamics in the EU by examining past policies, analysing case studies, and conducting critical analysis. It also looked at the impact of this relationship on EU integration and the sovereignty of member states. The study utilised a qualitative technique, examining policy papers, case law, and academic literature to evaluate the degree of Germany's impact on EU migration choices. Additionally, it examined the case studies of Greece and Italy as prominent instances of frontline states impacted by these policies. The study adopted Alexander Wendt's theory of constructivism for its better understanding. Data were drawn from secondary sources and were analysed using content analysis technique. The findings demonstrated that Germany's actions, although frequently aligned with its own national interests, have substantial consequences for the EU's collective migration policy and prompt inquiries regarding the distribution of power within the Union. The research enhanced the discussion on EU governance by emphasising the necessity for policies that uphold the varied economic and geographical circumstances of member states. It implied that reassessing the Dublin Regulation and creating a fairer mechanism for sharing migration obligations might strengthen unity within the EU. The study provided recommendations for future research and policy-making, highlighting the significance of Germany's contribution in promoting a cohesive yet adaptable European Union approach to migration

Keywords: Mass migration, European Union, Dublin Regulation.

Introduction

The surge of asylum seekers and migrants in 2015 and 2016 represented a critical moment for the European Union. This became a defining characteristic of the European Union's (EU) socio-political environment. The EU has responded to this problem in a thorough manner necessitating a complex coordination of internal policy adjustments, external border regulations, and diplomatic engagement with other countries especially countries of origin and routes used by migrants. Germany as the most populous country and economic powerhouse in the EU has been instrumental in the shaping of the EU's migration policy. Germany's open-door policy implemented by Chancellor Angela Merkel during the refugee crisis established the country as a prominent figure in the European Union's discussions on migration. However, it also caused tensions among the member states. Germany's significance inside the EU framework extends beyond the issue of migration. Germany's geopolitical objectives, particularly concerning the expansion of the European Union and its impact on Central and Eastern Europe have had a significant role in shaping the overall framework of EU policy (Lim, 2022). Nevertheless, the prominent position of the country has led to perceptions of excessive control, raising apprehensions over the EU's distribution of power and the autonomy of less influential member states (Lim, 2022). This has led to dissatisfaction towards the Union's migration policies and fuelled the argument that Germany is trying to impose migrants on the rest of the member states

Statement of the Problem

The role of Germany in the EU is deemed to be overbearing in the handling of the issue of mass migration in the Union. Unarguably, Germany is providing leadership role in the EU because it has the highest population and is politically and economically stable. Germany has been very vocal in the issues concerning the Union providing leadership in the Union with the support of France. Europeans believe that Germany exercises too much influence in the EU's decision-making process (Stokes, Wike, and Manevich, 2017). This is because the Maastricht treaty gave Germany a favourable position in the EU. Moller and Parkes (2012) were of the opinion that Italians view the Maastricht treaty as a German product because it was heavily influenced by Germany

The differential handling of Ukrainian refugees by the EU has intensified allegations of double standards, wherein migrants from Europe are subjected to disparate treatment compared to those from Africa and the Middle East (Hachkevych, 2022). The European migratory landscape has been altered by a succession of crises and corresponding political actions which demonstrate the continent's struggle against both internal and external influences. The migration crisis occasioned by many migrants from the Middle East and Africa escalated in 2022 due to the Russian-Ukrainian war, necessitating a reassessment of the European Union's migration policy framework (Adamyk & Stakhova, 2022). This reassessment is prompted not just by recent crises, but also by enduring challenges in harmonising the divergent interests of member states with the EU's shared ambitions. The shift in European migration policy is characterised by a change from labour migration to the admission of refugees and asylum seekers resulting in additional burdens on the social, transportation, and domestic infrastructures of receiving nations (Adamyk & Stakhova, 2022). Germany's role in this dynamic policy environment is crucial, considering its economic strength and status as the primary destination for migrants and refugees in the European Union. The nation's policies have regularly exerted influence over the trajectory and content of the European Union's migration and refugee policy (Longo & Fontana, 2022). Germany's dominant role in EU policy making has sparked debate. Some argued that it underscores the necessity for a fairer distribution of decision-making power within the EU (Tsai & Lin, 2022). The European Union's diplomatic leaders have been in the forefront of addressing the complex migratory problem which has been exacerbated by the pandemic and the war between Russia and Ukraine. The influx of Ukrainian migrants has brought attention to the shortcomings in the EU's foreign policy and the economic challenges faced by adjacent countries. This necessitated a new strategy to migration which is still in the process of being fully implemented (Abdrazakova & Zhabina, 2022).

The decisions made by the EU elites indicate that the current migration policies are just the initial steps towards essential adjustments in both the migration system and international relations (Abdrazakova & Zhabina, 2022). The influence of migration policy on market segmentation, namely in housing and rental markets inside the Eurozone is another facet of this intricate matter. Research has shown that policy uncertainty and public fear of migration have a significant impact on market dynamics. Specifically, Germany's migration policy risk has been found to have a noticeable effect on market segmentation (Tsai & Lin, 2022). This underscores the interconnectedness of migration policy with wider economic considerations, highlighting the significance of policies that consider both the immediate and lasting consequences of migration.

To this end, the leadership role of Germany in the migration policies of the EU during the migration crisis has led to a complex array of outcomes, encompassing both advantageous integrations and burdensome encroachments on the sovereignty of other the EU member states. This leaves one to ask; what extent is Germany's influence in line with the European Union's principles of solidarity and shared responsibility? Has Germany's actions contributed to or undermined the cohesiveness of the Union? In order to understand the present situation regarding migrants, it is important to take into account recent geopolitical crises, such as the prolonged conflict in Ukraine, which has resulted in a fresh influx of people seeking refuge in the European Union. This surge has not only impacted the political and socioeconomic situations of the countries hosting the migrants, but it has also brought attention to the challenges of creating a fair and well-rounded migration plan while considering national security concerns (Kravchenko & Zhuk, 2022).

Aim and Objectives

This study aims to analyse the effects of mass migration on the European Union, with a particular focus on the influence of Germany on the member states of the Union. To achieve the aim of the study, the study will be guided by two objectives namely to:

1) Evaluate the extent of Germany's economic and political dominance within the European Union and the Union's migration policy.
2) Investigate the impact of this dominance on the distribution of power and collaborative governance among member states.

Research Questions

The study aims to answer the following two questions:

1) How has Germany's economic and political hegemony inside the EU impacted the union's migration policy?
2) What is the effect of this on the distribution of power and collaborative governance among member states?

Theoretical Framework

Alexander Wendt's constructivist theory will form the lens through which the study will examine the role of Germany in the EU. Constructivism is a contemporary theory in international relations that highlights the importance of ideas, norms, and identities in shaping global politics. It differs from the prevailing realist and liberal perspectives. Contrary to realism's belief in predetermined state interests and focus on power, and liberalism's emphasis on institutions and cooperation, constructivism argues that the main structures in the state system are social rather than material. According to constructivism, these structures influence actors' identities, interests, and actions.

Constructivism originated as a distinct theory in the field of international relations during the late 1980s and early 1990s, aligning with the conclusion of the Cold War and a simultaneous shift in the global landscape. Academics started questioning the capacity of conventional theories to explain rapid and unforeseen shifts in global politics. The constructivist approach in international relations was greatly influenced by scholars like Alexander Wendt, who posited that the state of anarchy in the international system is a result of how states perceive and interpret it, suggesting that it is socially constructed rather than inherently prone to conflict (Wendt, 1992). The subsequent statements outline the fundamental assumptions of constructivism:

- Interests and identities are subject to change: Constructivists argue that state interests and identities are shaped via social interaction rather than being predefined.
- Norms and ideas are significant: State action is influenced and frequently motivated not just by material capabilities, but also by international conventions and beliefs.
- Social facts have equal importance to physical facts: Concepts such as sovereignty and territoriality arise from social agreement and behaviour.
- Interests can change over time due to processes of learning, persuasion, and socialisation, as they are not permanent.

Constructivism offers a perspective through which international relations may be understood as a global system shaped by human intelligence and social engagement. The argument posits that the world of politics is shaped by collective ideas and beliefs, which then influence how governments see their interests and identity. Alexander Wendt's constructivist theory offers a useful framework for examining Germany's purported dominance in the European Union (EU). Wendt argued that the international system, including the EU's internal dynamics is not naturally inclined towards conflict or dominance. Instead, he suggested that the state of nature in this system is shaped by the interactions and social constructions of its member states. This perspective is summarised by Wendt's famous postulation that "anarchy is what states make of it" (Wendt, 1992).

When considering Germany's role inside the EU, it may be argued that its influence is derived not just from its economic might or geopolitical location, but also from the shared social and political identity that EU member states attribute to it. Constructivism posited that the European Union (EU) is not a fixed organisation with predetermined power structures, but rather a fluid political context where the actions and roles of states are continuously challenged and redefined. The perception of Germany as a leading nation particularly in dealing with financial crises, migration, and EU governance, can be seen as a product of its historical relationships with other member states of the European Union. The European Union's response to crises such as the sovereign debt crisis and the migrant crisis has often been guided by established social norms and institutional practices that have developed over time. Germany's actions at this time which some have characterised as dominant, might be seen as influenced by these established standards that suggest that the largest and economically most powerful member must naturally take on a leadership role. The constructivist approach posited that state interests are derived from social interaction rather than being inherent. Germany's commitment to maintaining a stable and united EU, demonstrated by its rare display of strong policy positions, goes beyond mere power dynamics. It is a manifestation of a shared European identity that Germany has actively contributed to and is influenced by. This identity is based on common ideas such as democracy, human rights, and a longing for peace and stability. Germany's leadership in advocating for a consolidated approach to migration exemplifies these shared principles as well as the EU's collective character as a society that safeguards human dignity and promotes solidarity. The theory highlights the importance of norms in the field of international relations. Germany's approach to EU policy is driven by the normative perspective that as the most populous and economically powerful member in the EU, it bears the obligation to take the lead, especially in times of crisis. Germany does not unilaterally impose this notion, but rather other EU member states have adopted and reinforced it by their expectations and responses to German policies. From the constructivist perspective, Germany's involvement may be understood as both a demonstration of its influence and a response to the social norms and expectations established inside the framework of the European Union.

Change as per the constructivist idea may also be achieved through social learning and interaction. The perception of Germany's supremacy may change as the social context of the EU develops. The emergence of other influential economies inside the EU together with the growing assertiveness of institutions like the European Central Bank and the European Commission might lead to a re-evaluation of Germany's position and a reshuffling of responsibilities within the EU. The flexibility shown here is as a result of the constructivist assertion that state behaviours and roles are continuously formed and reconstructed through social practice. Again, the application of constructivist theory to Germany's involvement in the European Union allows for a more intricate examination that surpasses power dynamics and economic determinism. Germany's position is the result of an intricate interplay of social constructs, shared norms, and collective identities that have developed inside the EU over a period of time. The theory's focus on the social underpinnings of state interests, identities, and functions offers a valuable analytical framework for studying the dynamics of power and influence inside the EU, as well as the potential for political structural and procedural transformations.

Mass Migration

The historical backdrop of mass migration in Europe is a complex interweaving of political, economic, and social advancements. The continent has traditionally served as a platform for population movements, with each successive wave of migration having a lasting impact on the continent's cultural and demographic landscape. The European Union has had significant challenges in managing migration in recent times, particularly during the 2015 Syrian refugee crisis. This event marked a critical moment that tested the EU's policies and cohesiveness (Rugunanan & Meyers, 2023). This tragedy not only triggered a reassessment of migration management, but it also exposed the persistent difficulties of integration, border control, and the political implication of large-scale migration. The Czech Republic's tenure as the president of the European Union Council in 2022 brought attention to the ongoing challenges posed by illegal migration which have been exacerbated by the conflict in Ukraine and its subsequent refugee crisis (Vyrostko, 2023). The Czech Republic's experience highlighted the broader problem faced by the European Union in striking a balance between fulfilling humanitarian responsibilities and ensuring security and social harmony. The nation's endeavours to combat illegal migration encompassing a combination of enforcement and integrating measures exemplify the European Union's diverse approach to this intricate matter (Vyrostko, 2023).

Sweden's significant influx of migrants particularly from 2015 to 2019 provides a valuable framework for evaluating Europe's wider migration issues. Sweden's policies and reactions offer valuable insights into the successes and failures of EU migration policy. The nation received the second-highest number of asylum applications in Europe after the Syrian crisis (Rugunanan & Meyers, 2023). The Swedish case exemplified the clash between permissive immigration policy and the political and social strains associated with absorbing substantial influxes of refugees and migrants. The historical narrative of migration encompasses not just policy and demography, but also the cultural expressions and contributions of migrants.

The literature on mass migration in Europe presents a complex portrayal of a continent grappling with the repercussions of human movement. Understanding present policies and debates necessitates an understanding of the historical backdrop of these movements. This phenomenon demonstrates a migratory trend influenced by a combination of factors including warfare, economic prospects, and the desire for improved living conditions. These factors still shape the way the continent deals with present challenges in managing migration.

Germany's Role in EU Migration Policy

The complexity of Germany's role in EU migration policy is influenced by its historical context, economic might, political sway, and ability to address specific migrant crises. Germany's historical policy overview of its role in EU migration policy reveals a transformation from a country greatly impacted by post war population movements to a leading contributor to the EU's migration strategy in the twenty-first century. The Gastarbeiter ("guest workers") programmes that Germany implemented in the 1950s and 1960s laid the foundation for subsequent governmental stances on economic migration. These projects were established to address employment shortages but ultimately, they made a significant contribution to Germany's multicultural composition. Germany's policies underwent a transformation to align with the increasing aspirations of European integration when the European Union was established and grew. This involved striking a balance between national interests and the collective objectives of the EU (Lahav & Messina, 2023). The influence of Germany's economy and political power within the EU has been significant in shaping the bloc's migration policy. Germany, as the largest economy in the EU is often seen as leading the way on migration matters, especially during crises that challenged the EU's internal unity and external borders. Due to its strong economic influence, the country plays a crucial role in shaping policies that encompass both humanitarian and economic aspects. This is because the country serves as both a destination for migrants and a supporter of the EU's ideals of freedom of movement and solidarity.

Again, a critical examination of German influence on migration policy decisions illustrates the country's crucial role in tackling migratory challenges. In the context of the 2015 refugee crisis, Germany's choice to temporarily halt the Dublin Regulation for Syrian refugees was a significant policy shift that showcased its dedication to providing humanitarian protection. This move also shed light on the challenges of achieving unanimous agreement among EU member states over the distribution of responsibilities. Germany's independent action, driven by Chancellor Angela Merkel's assertion of "Wir schaffen das" ("We can manage it") received commendation for its moral guidance but also faced criticism for exacerbating tensions within the EU on migrant policy (Gukepshev, 2023). The regulation of migratory flows in Germany has had a significant impact on the EU's migration and asylum policies, namely the Common European Asylum System (CEAS). The development of the CEAS signifies a shift towards "externalisation," when the EU, under the leadership of Germany, aims to control migration by establishing agreements with third nations, often at the cost of internal unity over migration issues. Gukepshev (2023) has raised concerns about this approach, arguing that it may undermine the rights of refugees and place a disproportionate burden on nations that are ill-equipped to handle large numbers of migrants. The Visegrad Group, sometimes referred to as the V4, comprises Hungary, Czechia, Poland, and Slovenia. It has conveyed its discontent or dissatisfaction over Germany's position on migration. The group's lack of commitment towards EU migrant solutions, exemplified by Hungary's steadfast approach is in direct opposition to Germany's stance and reflects the internal divisions inside the EU. The V4 nations have opposed Germany's and Austria's attempts to limit migration, viewing the proposals from Brussels as a threat to their national identity and independence. The critique of the V4 emphasises the challenges Germany faces in balancing its leadership position with the need to consider the many opinions inside the EU (Peshkin, 2023).

Methodology:

The study employs descriptive and historical research designs. The selection of these designs is justified as they provided the researcher a sufficient opportunity to present comprehensive information on the history, activities, difficulties, and prospects of the variables being studied. The research designs facilitated the examination of Germany's diverse involvement in formulating EU migration policy. The objective is to understand the political and economic issues that influence the development and execution of policies within the framework of the European Union. The study's data were derived from secondary sources. This study employed a secondary data collection method, wherein it gathered and compiled data from pre-existing literature sources.

Hence, it relied exclusively on information acquired from textbooks, journals, articles, and newspapers. Conversely, the researcher carefully and deliberately chose these information. The selection of material was based on its relevance to current events. This study used content analysis to analyse the data collected.

Germany's Overbearance: Perceptions and Realities

The position of Germany in the European Union (EU) has been the subject of intense debate often focusing on the perception of its hegemony inside the union. This perception arises from Germany's significant economic and political influence which has functioned as both a factor of stability and a cause of disagreement within the EU. Germany's impact is evidenced empirically in several policy domains encompassing fiscal policy, trade policy, and migration policy. This has had extensive implication for other member nations. The perception of Germany's dominance is justified. Germany's economic might as the largest country in the EU grants it substantial influence over the Union's policies. This influence extends beyond the realm of economics and include political and institutional influence on the decision-making processes of the European Union. Germany's prominent position in the EU politics was reinforced by its leadership role, especially during the Eurozone crisis. Chancellor Angela Merkel emerged as the primary spokesperson for the Union (Kaczmarczyk & Lis, 2023). The country's commitment to the EU principles, including as the advancement of sustainable energy, highlights its influential position in shaping the EU policy directions (Kaczmarczyk & Lis, 2023).

Germany's impact is more complicated than the assumption of supremacy implies. Germany's influence inside the EU is significant, although its actions are often the result of consensus-building and discussion rather than making decisions unilaterally except for few instances. For example, Germany's open-door policy during the 2015 migration crisis was a unilateral choice prompted by the urgent need to address a humanitarian emergency. The decision had a cascading effect on other EU member states, prompting diverse responses and highlighting the challenges in harmonising a consistent EU migration policy (Gukepshev, 2023).

Germany's involvement in the EU is not exceptional in terms of influence when compared to other prominent member nations. However, it stands out due to the size and significance of its economy. France's significant contribution to shaping the EU policy is often counterbalanced by Germany's perspectives which frequently diminishes its influence and impact. The Franco-German alliance is a significant catalyst inside the EU since both nations consistently align their policies to shape the Union's agenda (Peshkin, 2023). The tangible proof of Germany's impact on individual member states is intricate. Germany's fiscal and economic policies significantly influence the economic stability of the Eurozone and consequently affect the economic policies of other member nations. Moreover, Germany's position on matters that concern the whole European Union sometimes sets an example for smaller countries who may either support or oppose German policies, therefore complicating the impression of German influence (Peshkin, 2023).

An examination of Germany's influence on the EU migration policy and its consequences for member states may be conducted by examining Greece, which has faced significant migration challenges due to its strategic geographical position as a primary entry point into the EU for numerous migrants and refugees. Greece's capacity to handle migration has been greatly impacted by the Greek financial crisis and the subsequent implementation of austerity measures by the European Union spearheaded by Germany. The crisis revealed the vulnerabilities of the EU's consolidated monetary policy, as well as the challenges encountered by member nations with divergent economic circumstances. The perceived rigidity of the European Central Bank's policies commonly associated with German fiscal prudence, has had detrimental effects on Greece's economic development and stability. Thereby impacting its migration policy and capacity to assimilate and include migrants (Liu, 2023). The empirical evidence demonstrated that the implementation of austerity measures which were mandated as a prerequisite for Greece's financial rescue, resulted in significant societal and economic adversity. This in turn exacerbated the challenges faced by the large influx of migrants and refugees. The issue was aggravated by the EU's Dublin Regulation, which imposed excessive burden on frontline states like Greece to handle refugee applications. Germany's decision to suspend the Dublin Regulation for Syrian refugees in 2015 had both positive and negative consequences. On one hand, it alleviated part of the burden on Greece. On the other hand, it led to a significant increase in the number of migrants who expected similar treatment thereby overwhelming the resources available in Greece (Liu, 2023).

Additionally, the case of Greece serves as a clear example of the wider implications of migration policies driven by Germany inside the European Union. The Common European Asylum System (CEAS) influenced by German policy preferences, has been criticised for its uniform approach that does not take into consideration the unique challenges encountered by each member state. The implementation of the Common European Asylum System (CEAS) has been inconsistent throughout the European Union. Countries like Greece have been disproportionately affected by its shortcomings, mostly due to their geographical vulnerability to migrant movements and limited economic resources to effectively address the situation (Orfanidou, 2023). Contrasting with other EU member states, Greece's position diverges due to its unique migration strain and comparatively weaker economy to address these challenges. The case of Greece serves as an example of how German policies which aim to find solutions that benefit the whole European Union can have different impacts on certain member states. This highlights the intricate nature of transferring and implementing policies within the EU's complicated system of governance.

Discussion of Findings

The perception of Germany's participation in the EU migration policy varies within the framework of the EU's political economy. Germany as the de facto head of the EU because of its strong economy, has had a significant influence on the union's response to migration, which is a reflection of wider economic and political changes. The country's economic stability and openness to accept migrants during the 2015 crisis were seen as gestures of solidarity that were in line with its economic interests, considering its ageing population and labour market requirements. Nevertheless, these actions sparked debates over the limits of national autonomy and the tenets of the EU integration. The convergence of German interests and the dynamics of EU migration present a challenging endeavour of maintaining equilibrium. Germany's actions during the migrant crisis were aligned with its national interests, as they effectively tackled demographic challenges and handled labour scarcities. However, these initiatives had to consider the interests of other EU member states, some of which were reluctant to accept migrants owing to economic constraints, challenges with social integration, or worries about security. This scenario highlighted the clash between the interests of individual nations and the collective actions of the European Union which is a significant concern in the political economy of the EU (Börzel & Risse, 2023).

The stance that Germany takes on migration policy has extensive implications for the cohesion and sovereignty of the EU. The concept of solidarity is crucial to the EU's character, however, the migration crisis served as a litmus test for this solidarity. Germany's original unilateral open-door policy eventually resulted in a more coordinated response throughout the European Union, which included the controversial EU-Turkey accord and the proposal to relocate asylum-seekers. These measures have generated controversy, as some argue that they represent a step towards greater integration, while others perceive them as a relinquishment of national autonomy (Thielemann & Armstrong, 2012).

The EU's ongoing sovereignty argument is not novel, but the issue of migration has propelled it to the forefront of attention. The perception of Germany's dominance is occasionally regarded as a threat to the sovereignty of smaller or less economically strong member states. Germany's actions should be considered within the framework of its dedication to the EU project and its fundamental principles. Despite the potential restriction on individual state autonomy, the country has consistently played a significant role in promoting the alignment of policies throughout the EU, hence enhancing the overall cohesion of the union (Schimmelfennig, 2024).

Conclusion

Germany's strong economic power and influential political position inside the EU have established it as a crucial participant in shaping the migration policy of the union. This has led to the claim of it pursuing a hegemonic tendency at the detriment of others. The impact was particularly evident during the 2015 migrant crisis, when Germany's decision to welcome Syrian refugees diverged dramatically from the EU's usual approach and influenced the bloc's subsequent migration strategy. The analysis of Greece has demonstrated the intricate role of German policies on the EU's strategy towards migration. Thus, highlighting the intricate relationship between individual national interests and collective action within the EU. The study also revealed that the power dynamics and cooperation inside the EU suggest that Germany's influence, albeit significant, is not exclusive. The EU's framework necessitates collaboration and the establishment of consensus, often with Germany's actions serving as a catalyst for more extensive policy and integration deliberations.

The primary role of the EU is to maintain this intricate equilibrium while adjusting to emerging obstacles. If Germany's leadership operates within the parameters of EU ideals and engages in consultations with other member states, it has the potential to serve as a constructive catalyst for change. Germany's impact on the EU’s migration policy exemplifies its commitment to the EU's purpose and the intricacies of European integration. The country's actions have exerted a substantial influence on the political economy of the EU, as well as the ongoing debates on sovereignty that are shaping its future. The EU's ongoing evolution will continue to prioritise the balance of power and collaboration as it addresses challenges related to migration, economic disparity, and political transformation. The conclusion consolidates the elements of economic power, political sway, and the subsequent policy consequences on member states in analysing Germany's position inside the EU, particularly in determining migration policy. The leadership of Germany has had both positive and negative consequences, as it has offered guidance during times of crisis but has also caused debates over excessive control and independence.

Recommendations

Having examined the role of Germany's involvement in the EU migration policy and its wider implications for EU integration and sovereignty, the study therefore recommends the following:

1. The European Union should bolster measures that promote member-state solidarity in the equitable distribution of responsibility for refugees. This may entail amending the Dublin Regulation to provide a fairer allocation of asylum claims processing and support to countries at the forefront of the issue.
2. The European Union should provide specific economic assistance to frontline governments, such as Greece, to enhance their infrastructure and integration projects relating to migration. Germany should take the lead in subsidising these endeavours.
3. Germany should maintain a high level of cooperation with other EU member states in order to achieve a consensus on migration policy. This entails showing deference to the varied perspectives inside the European Union and establishing consensus on delicate matters.
4. Germany and the EU should allocate resources towards addressing the fundamental causes of migration, including conflict, climate change, and economic inequalities, in both countries of origin and transit.

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THE USE OF INTONATION AMONG IGBO-ENGLISH AND IBIBIO-ENGLISH BILINGUALS: A CONTRASTIVE ANALYSIS

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Abstract

Many studies on contrastive analysis have not sufficiently captured intonation assigning of major and minor Nigerian languages. This work contrastively analyzed the use of intonation in the spoken English of Igbo-English and Ibibio-English bilinguals. This was aimed at identifying the percentage differences and similarities in their assigning of tunes in order to ascertain their levels of international intelligibility. As qualitative and quantitative research, the study adopts a descriptive survey design and applies the tenets of Contrastive Analysis Hypothesis (CAH) and Metrical Phonology Theory (MPT) to account for their percentage differences and similarities. The study area consisted of Igbo and Ibibio speaking areas with the population comprising graduates from eight Nigerian tertiary institutions. The sample size consists of 182 educated Igbo and Ibibio English speakers selected through random sampling technique. The data used were phrases and sentences generated by the researcher to elicit information from the subjects through recording and were further analyzed acoustically. The findings reveal that Igbo-English and Ibibio English bilinguals have varying percentage differences and similarities in their intonation usage which was traced to exposure of some respondents to EL1 countries and personal effort; though not remarkable enough to impede mutual communication but may affect international intelligibility. This study concludes that the differences at supra-segmental features of Igbo-English and Ibibio-English do not emanate from any difference between the two languages; it is based on individual development of such speakers and exposure. This study recommended a further study of the spoken English performance of Igbo-English and Ibibio-English bilinguals who grew in an EL1 context and those who studied English in Nigeria at the supra-segmental. This study enriches existing literature on Contrastive analysis, with emphasis on intonation in the spoken English of Igbo and Ibibio bilinguals. In practice, the study benefits phonologists, linguists,

language students, and every other language user by providing empirical material for further analysis.

Keywords: Intonation, Contrastive analysis, Bilinguals

Introduction

The challenges of spoken English in Nigeria can be traced to many factors. First, English has twenty vowels, while other Nigerian languages (like Igbo and Ibibio) have fewer vowel sounds. Some Nigerian vowels are very close to their English counterparts, while others are very different. To make matters worse, many English as a Second Language (ESL) speakers find it challenging to pronounce English words correctly since some English vowels do not resemble the vowels in their native language. At the highest segmental level of linguistic analysis, English is intonational, while other Nigerian languages are tonal. According to Obi-Okoye (2008), this distinction distinguishes English from the native languages of most ESL students with respect to stress pattern, rhythm, pause, accent, and intonation (p.25).

Because of this reliance on intonation, the placement of emphasis is not rigid in English. For most Nigerian languages, such as Yoruba, Hausa, Ibibio, and Igbo, the correct oral production is wholly dependent on a different kind of stress realised through the tonal manipulation affecting the quality of speech as high, medial, or low, and this is true even for discriminating grammatical categories. Anyanwu (2016) asserts:

> The stress or tonal position of the Igbo language is almost permanently fixed on the vowel, particularly since words usually begin and end with a vowel, to realize vowel – consonant – vowel (VCV) scheme. The only consonant sounds which carry some elements of tone in Igbo, for example, are syllabic nasals such as /m/, /n/ and /nw/. The slightest mistake in applying the correct tone, not stress as it is the case with English, changes the entire meaning. (p. 25)

Akere (2004) argues that because English is learned as a second language, rather than attempting to handle two phonological systems separately, what actually happens is an adaptation of the indigenous phonological system for speech sounds and pattern (p. 107). This occurs, for example, when a Nigerian-born English-speaker completely eliminates the distinction between long and short vowels and similar nuances. This demonstrates that no two languages are grammatically equivalent, making literal translation across languages highly unlikely. Given that many educated Nigerians from different linguistic and ethnic backgrounds speak English differently, leading to the ethnic varieties of English, it is expected that their speech production will exhibit different prosodic features which are worth investigating.

Having seen lots of research works on the segmental features of English in contrast with the sub varieties of Nigerian English and , it is imperative, therefore, that attention should be given be to contrastive analysis at the supra- segmental level with a major and major minor variety.

Thus, the present study contrastively analyses the assigning of tunes in the spoken English of Igbo-English and Ibibio- English bilinguals.

Statement of the Problem

There is a high level of phonological incongruities between the spoken Nigerian Englishes and the Standard English especially at the prosodic level. These clashes have led to some level of unintelligibility of Nigerian varieties. Igbo, Hausa, and Yoruba Englishes has been studied and discovered to have this challenge of intelligibility. Consequently, it is equally necessary to undertake a study of two or more varieties of English in Nigeria to contrastively determine their supra-segmental features, the areas of similarities and differences in these features, as well as to determine which variety has a better representation of the English supra-segmental sounds than the other(s). Therefore, this research is to contrast Igbo and Ibibio Englishes on their use of intonation towards ascertaining which variety is closer to the Standard English.

Objectives of the Study

The objectives of the study are to:

1. identify the differences in the assigning of tunes in the English spoken by Igbo-English and Ibibio English bilinguals;
2. highlight the similarities in the use of intonation in the spoken English of Igbo-English and Ibibio-English bilinguals.

Research Questions

In order to achieve the objectives of this study, the following research questions will be adopted to guide the study.

1. What are the differences in the assigning of tunes in the spoken English of Igbo-English and Ibibio-English bilinguals?
2. What are the similarities in use of intonation in the spoken English of the Igbo-English and Ibibio-English bilinguals?

Significance of the Study

The findings of this study will be beneficial to language teachers and students who will find the study useful for ESL teaching and learning purposes. While it will help the teachers in their coordination of learning activities and will also facilitate their application of the most appropriate approaches to focus on specific problem areas where the L2 learners of English in Nigerian schools have difficulty in mastering the prosodic aspects of English phonology, it will also help to proffer solutions to some of the challenges that the students face in their spoken English learning process.

Literature ReviewIntonation in the English Language

Not everyone speaks at the same pitch and volume when conversing normally. A language's intonation is made up of variations in pitch as well as other speech characteristics like loudness and length. Pitch range variation and other features of voice are together referred to as "intonation."Muniem (2015) posits that intonation is a property of pronunciation that is common to all languages. Accent, linked speech, rhythm, and emphasis are other factors that affect pronunciation. Tone, like these other elements, is about how we say something, not what we say. Thus, we might define intonation as the manner in which we convey specific ideas and moods through the pitch of our voice. It can "differentiate between many interpretations that have the ability to turn the declarative statement into an interrogative one" (Mirfatemietal., 2020, p. 23).

The rise or decline in voice quality is related to intonation. Ufot (2009, p. 63) defines pitch as "the relative depth or height that is conveyed by speech level."The majority of Nigerian languages are tonal, which implies "that words—not sentences—or words with sentence status are what cause the voice to rise and fall," according to Udofot (2007, p. 23), who is analysing Nigerian English. "In English, a lot of the attitude implied by tone is lost," the writer says. In English, intonation also has grammatical significance. A declaration of truth is expressed in a different tone than a request, expression of thanks, etc. The tone employed in a speech is influenced by the speaker's own mood. Since people's emotions cannot be universally agreed upon, Eka (1993, p. 83) contends that intonation might instead be defined as "...mostly unique, customary within a community, and typically varying across individuals."According to Eka (1996), the unique quirks may be mostly chosen depending on the speaker's educational background, which affects the range of Nigerian English spoken, including non-standard, basic, standard/educated, and sophisticated/near native.

In English, intonation also refers to variations in rhythm and stress in addition to changes in voice pitch. Different emotional meanings, such as surprise, boredom, rage, wariness, etc., are conveyed by intonation (Britannica, 2020b). Tone serves the grammatical purpose of distinguishing one kind of phrase or sentence from another in several languages, including English. As a result, "Your name is John" is a straightforward statement that starts with a medium pitch and ends with a lower one (falling intonation); conversely, "Your name is John?" poses a question and has a rising intonation (high final pitch).

According to Smith (2002), the term ‘intonation’ is used in two senses - a wide and a limited sense. The phrase was employed above in its broadest definition. The word refers to information that is generally communicated through prosodic qualities. When used in a restricted context, the term refers to information that is expressed by pitch during a speech segment longer than a word. Both grammatical and non-grammatical information can be communicated by intonation. The linguistic information is sent to differentiate phrases inside sentences through characteristics of their borders and by drawing contrasts between commands and requests, inquiries and declarations. Non-grammatical information is sent to indicate the speaker's attitudes and feelings towards the subject, including warmth and coldness, enthusiasm and boredom, and politeness and rage.Form and function are the two fundamental facets of intonation that we examine. Function is the grammatical and pragmatic information that is expressed by intonation. Whereas pragmatic information pertains to the meaning of a speech based on its context, grammatical information relates to the linguistic meaning of an utterance. Pitch and other associated aspects of speech are used to express intonation.

Gimson (1980) proposes that intonation is relevant in English by its performance of two main functions: accentual, in the sense that pitch alterations are the most efficient technique of rendering a syllable or word more apparent; and non-accentual, that intonation may be used to differentiate between assertions and inquiries.As a means of expressing our sentiments in relation to what we are saying, this second function will also assist to reveal the speaker's emotional views. Therefore, English uses tone to convey both personal attitude and grammatical structure, such as distinguishing between questions and assertions (Uribe, 1989, p. 55).

A rising or falling tone can be distinguished fairly easily, but the fall-rise and rise-fall tones are more challenging to distinguish when they are prolonged because the syllable structure frequently breaks or distorts their pitch changes (Roach, 2009). This also implies that intonation may not be gainfully studied without resort to an examination of the pitch of the language being studied.

From the ongoing, it is very clear that the different supra-segmental sounds of English are connected to one another. In other words, none can actually function or be realized without relating or connecting to the other. This is why it becomes important that in spite of discussing them individually for clarity’s sake, supra-segmental features interconnect in English. Just as every language has its segmental sounds, each also has its supra-segmental sounds, English inclusive.

Similar to how stress influences an utterance's meaning, intonation similarly fluctuates to produce differences in the speaker's emphasis, inference, attitude, etc. All languages communicate modulations of the meaning represented by words through variations in pitch during an utterance. Tonality in English may impact a sentence or a whole speech. Pitch rises and falls in a certain way show intonation.There is a distinction between a question and a statement in the English language. An example of a statement is "She is coming," which has a pitch drop on the final syllable. It becomes a query when spoken with an increase in pitch on the final word (She is coming). When Pike observes that many intonation contours have specific meanings, he means this. Pitch variations can also indicate other types of information, such as the speaker's emotional state—such as whether they are pleased, sad, or angry—as well as information regarding the grammatical structure of the sentence. It is challenging to pinpoint the precise meaning differences that are conveyed by various intonation patterns, because they vary slightly between languages and within English dialects. This is the driver whose particulars were seized.

It is an interesting book; I will buy it.

Say the truth, shame the devil.

Many Expressions: Extended utterances consist of several phrases that, with the exception of the final clause, which adopts a falling tune, all have an intrinsic rising tune on the final stressed syllable.

The Governor attended the occasion, addressed it, donated a long bus, and left for another function.

He arrived, greeted, zoomed away.

He came, saw, conquered, and left.

The pastor worship, praised, preached and blessed the congregation.

iv. Tag Questions: In this case, the tune goes up for the last section, which is the question tag, and down for the first half, which is a statement.

The books are cheap, Aren't they?

The rain will fall, Won't it?

You will travel, won't you?

I have some money, don't I?

v. Either–or Expressions

Either he is good or he is bad.

Either you go to work or you lose your salary.

Either you stay here or you leave.

Either you talk or I punish you.

It is the combination of stress and intonation that gives accentuation. Accentuation is the process of making one or more syllable structures stand out more than the rest. "Accentuation pertains to the entire amount of effort a speaker expends when articulating a syllable," according to Eka (2009, p. 91). Pitch, time length, and stress are all considered in accentuation. Stress indicates how loud a speaker is perceived by the listener. Speaking Nigerian English in nonstandard and basic variations, speakers have "no fixed accentual pattern," according to scholars studying the languages spoken form (Eka, 2000, p. 91), and accentuation varies from inventive to educated or almost native realisation. It should be noted that a speaker's accent may reveal a lot about their educational background, degree of comprehension when speaking, and type of spoken Nigerian English they employ.

Theoretical Freamework

This work employed two theories: Contrastive Analysis and Metrical Phonology theory.

Contrastive Analysis

The choice of this theory is informed by the aim of the study which is a contrastive analysis of analysis of the use of intonation of the languages under study. Apparently, this exercise can best be hinged on Contrastive Analysis.

The theoretical foundation for Contractive Analysis Hypothesis was formulated in Robert Lado's book titled: *Linguistics Across Cultures: Applied Linguistics for Language Teachers*. Contrastive analysis is the comparison of two equivalent portions of two different languages which is usually the first language of the learner and the target language. Lado (1957) claimed that those elements which are similar to the learner's native language will be simple to learn and those elements that are different will pose a problem.

Results and Discussion

Analysis of the Test on Intonation

Voice quality fluctuation is related to intonation. Pitch is included. The relative height or depth that is conveyed in the voice level during communication is referred to as pitch. Phrases that represented the falling tune, the rising tune, and the combined tunes employed in this study were used as examples for the intonation analysis. The tunes of the sentences are indicated by the use of arrows – either upward or downward strokes to indicate the control's tunes. The strokes slanting upwards or sloping downwards reveal the melodies employed by the control. The voices of the respondents are captured and at the end of the recording, the tape recorder is played again and the readers' voices transcribed by the researcher.

Simple Declarative Statements:

The orange is sweet.

The man is great.

I went to the supermarket today.

I saw him yesterday.

The book is interesting.

Table 4 Analysis of Respondents from Igbo-English Bilinguals on Declaratives

Respondents	NAU	Alvan	Imsu	Umunze	Total	Percentage
Number of correct tune	21	22	19	20	82	90%
Number of incorrect tune	2	1	4	2	9	10%
Total	**23**	**23**	**23**	**22**	**91**	**100%**

Analysis of Respondents from Ibibio-English Bilinguals on Declarative

Respondents	University of Uyo	Univ. of Calabar	AISU	CRSU	Total	Percentage
Number of correct stress placement	18	20	18	19	75	82%
Number of incorrect stress placement	5	3	5	3	16	18%
Total	**23**	**23**	**23**	**22**	**91**	**100%**

Command or Order:

Go there.

Get him punished.

Call him now

Sit down and listen

Eat your food.

Table 4.28 Analysis of Respondents from Igbo-English Bilinguals on Commands

Respondents	NAU	Alvan	Imsu	Umunze	Total	Percentage
Number of Correct Tune	20	19	19	20	78	86%
Number of Incorrect Tune	3	4	4	2	13	14%

Total	**23**	**23**	**23**	**22**	**91**	**100%**

Analysis of Respondents from Ibibio-English Bilinguals on Commands

Respondents	**University of Uyo**	**Univ. of Calabar**	**AISU**	**CRSU**	**Total**	**Percentage**
Number of Correct Tune	21	18	19	18	76	84%
Number of Incorrect Tune	2	5	4	4	15	16%
Total	**23**	**23**	**23**	**22**	**91**	**100%**

WH- Questions:

What's your name?

Where's the computer?

How are you doing?

When are you coming?

What did he say?

Table 4.29 Analysis of Respondents from Igbo-English Bilinguals on WH- Questions

Respondents	**NAU**	**Alvan**	**Imsu**	**Umunze**	**Total**	**Percentage**
Number of Correct Tune	21	22	21	20	84	92%
Number of Incorrect Tune	2	1	2	2	7	8%
Total	**23**	**23**	**23**	**22**	**91**	**100%**

Analysis of Respondents from Ibibio-English Bilinguals on WH- Questions

Respondents	**University of Uyo**	**Univ. of Calabar**	**AISU**	**CRSU**	**Total**	**Percentage**

Number of Correct Tune	22	21	21	21	85	93%
Number of Incorrect Tune	1	2	2	1	6	3%
Total	**23**	**23**	**23**	**22**	**91**	**100%**

Exclamations:

Gracious God!

Ah, I've lost my pen!

Oh, this is bad!

Wow, it is interesting!

Ah, this is bad!

Table 4.30 Analysis of Respondents from Igbo-English Bilinguals on Exclamations

Respondents	NAU	Alvan	Imsu	Umunze	Total	Percentage
Number of Correct Tune	19	18	21	20	78	88%
Number of Incorrect Tune	4	5	2	2	11	12%
Total	**23**	**23**	**23**	**22**	**91**	**100%**

Analysis of Respondents from Ibibio-English Bilinguals on Exclamations

Respondents	University of Uyo	Univ. of Calabar	AISU	CRSU	Total	Percentage
Number of Correct Tune	20	22	19	18	84	85%
Number of incorrect stress placement	3	1	4	4	12	15%
Total	**23**	**23**	**23**	**22**	**91**	**100%**

Firm gratitude:

God bless you.

Thank you.

You are blessed.

Keep it up.

Table 4.31 Analysis of Respondents from Igbo-English Bilinguals on Firm Gratitude

Respondents	NAU	Alvan	Imsu	Umunze	Total	Percentage
Number of Correct Tune	21	22	19	20	82	90%
Number of Incorrect Tune	2	1	4	2	9	10%
Total	**23**	**23**	**23**	**22**	**91**	**100%**

Analysis of Respondents from Ibibio-English Bilinguals onFirm Gratitude

Respondents	University of Uyo	Univ. of Calabar	AISU	CRSU	Total	Percentage
Number of correct stress placement	18	20	18	19	75	82%
Number of incorrect stress placement	5	3	5	3	16	18%
Total	**23**	**23**	**23**	**22**	**91**	**100%**

The data analysis of the data above showed that, whereas some individuals had almost the same amount of anticipated intonation phrases, our respondents behaved differently on anticipated intonation phrases. Some of our participants served as excellent examples of this, having either directly interacted with native speakers or established their own native speech patterns. This indicates that accentual pattern is improved by interaction with native speakers. Additionally, it was noted that our subjects had a greater proportion of falling and rising songs than rise-fall and fall-rise tunes. Another finding was that there were variations in the distribution of intonation phrases among our individuals, even when their intonation phrases were almost exactly as predicted (fall-rise and rise-fall). Once more, the differences in each respondent's unique performance were due to differing levels of competence determined by their interactions with native English speakers and their command of the language. The study likewise noted that the shift in accentual pattern may not create communication barrier among Igbo speakers of English, but may be a challenge to the native or near-native speakers of the English language.

Conclusion

Having carried out the review of relevant scholarship and having presented and analysed the data of this study, the study therefore concludes that there is no significant difference between the Igbo-English and Ibibio-English at the supra-segmental level. It is clear from the study that the results of the perceptual/statistical, metrical and acoustic analyses as retrieved from the responses of the respondents show that the Igbo-English and Ibibio-English vary greatly from the control's version which is the Standard English. However, there are slightly percentage differences at the prosodic level, between the Igbo-English and Ibibio-English at varying points.

From the findings, we conclude that there are no remarkable differences between the Igbo-English and Ibibio-English in their use of intonation.

It is clear from the study that the results of the perceptual/statistical and acoustic analyses as retrieved from the responses of the respondents that the Igbo-English and Ibibio-English vary greatly from the control's version which is the Standard English.

However, this shows that the type of English spoken by the participants is not the standard model of pronunciation but just a sub-variety of the varieties of Nigerian English (NE) despite their level of educational background.

Recommendations

1. This study recommends a further study of the spoken English performance of Igbo-English and Ibibio-English bilinguals who grew in an EL1 context and those who studied English in Nigeria at supra-segmental level.
2. This study recommends that Nigerian tertiary institutions should procure and use instruments/devices that aid spoken English such as sound spectrograph, speech synthesizer, pitch metre/computer, audio frequency filter and cinematograph. This will improve the knowledge of supra-segmental features of English as there are no significant differences in the two languages to hinder English communication.

3. This study recommends that Nigerian linguists should write more books and carry out further researches on the two languages with emphasis on their supra-

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LES FORMES DE PLURIEL DE NOMS EN ISOKO

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Abstract

Isoko, une langue edoïde est parlée au sud-ouest du Nigéria. Très peu de linguistes et auteurs ont écrit sur les formes plurielles de noms en Isoko. Ils n'ont identifié que deux marques de pluriel mais ils ont laissé une partie. Ils n'ont pas identifié d'autres marques de pluriel et ils n'ont pas spécifié le nombre total des marques de pluriel en isoko que cette recherche vise á adresser. On poursuit cette recherché pour identifier toutes les marques de pluriel de la langue pour une étude scientifique qui vise à avancer la langue Isoko qui est au bord de l'extinction. Le travail est basé sur la théorie linguistique de structuralisme. Les données sont primaires et secondaires recueillies de livres linguistiques et celles fournies par les locuteurs natifs. Les marques de pluriel acceptées par les noms sont identifiées. Basés sur les résultats tirés du travail à partir de données analysées, l'étude conclue qu'il y a plus de deux marques de pluriel qui aident le procédé de pluralisation de noms en isoko. Les recommandations sont présentées notamment que les autres marques de pluriel découvertes du procédé de la pluralisation des noms pourraient utiliser pour faciliter l'étude scientifique de la langue isoko.

Mots clés: pluralisation, langue edoïde, structuralisme.

Introduction

La pluralisation est un phénomène linguistique de pluraliser un mot dans une langue donnée que ce soit un nom, que ce soit un verbe ou les autres mots de classes lexicales différentes. Le phénomène du pluriel se trouve dans tous les langues du monde. Selon Ade-Ojo (2005), la pluralisation consiste à mettre un nom singulier au pluriel, c'est-à-dire, d'une unité à plus d'une unité. La définition d'un nom par de Bortolussi et al (2007) montre tous les traits du nom présenté ainsi:

> ‘’le nom appelé aussi le substantif est un mot qui désigne: - un être vivant, animé, il peut s'agir d'un être humain, d'un animal; - une réalité abstraite, inanimée: il peut s'agir d'un objet concret, d'une action, d'une notion abstraite, d'un sentiment. Le nom a un genre défini, indiqué par le dictionnaire; il peut être de genre masculin ou de genre féminin; - le nom est un mot variable en nombre; il peut être au singulier ou au pluriel.’’

Dans la définition ci-dessus, nous constatons le caractère du nombre que porte le nom. Le nom peut être singulier ou pluriel. Sur le nombre, Donwa-Ifode (2005:308), affirme que le nombre est le paramètre utilisé pour déterminer si un nom est singulier ou pluriel, c'est-à-dire, une ou plus d'une unité. Avant d'arriver à la forme plurielle de la forme singulière en isoko on doit suivre un procédé. Ce procédé est une opération linguistique qui utilise les affixes. Cette opération linguistique s'appelle affixation. Selon Larousse (2009) cité par Agbagbatu (2014), un affixe est un élément qui se met au commencement (préfixe), à l'intérieur (infixe) ou à la fin (suffixe) d'un mot pour en modifier le sens ou la valeur grammaticale. Isoko sert la prefixation à la pluralisation des noms.

Isoko est une langue edoïde. Selon Elugbe (1989), Williamson (1989) les langues edoịde sont les langues qui viennent de la grande famille de langue de Niger-Congo. Les langues edoïdes sont parlées au sud-ouest du Nigéria. Isoko est une langue tonale. Elle n'est pas linguistiquement très développée, et les locuteurs sont peu et n'utilisent pas fréquemment la langue donc, isoko est au bord de l'extinction comme Umukoro (2016) a affirmé.

Le cadre théorique

Ce travail est basé sur la théorie linguistique du structuralisme. Le structuralisme est établi par le linguiste Ferdinand de Saussure à partir du livre *Cours de Linguistique Générale* publié par ses deux élèves Charles Bally et Albert Séchehaye en 1916. Saussure base le structuralisme sur le signe qui est un élément linguistique. Il postule que les signes linguistiques ne sont pas significatifs lorsqu'ils sont isolés. La signification revient aux signes linguistiques lorsqu'ils s'interagissent. Obitube (2016) affirme que ''le structuralisme est une théorie dans laquelle les éléments linguistiques ne sont pas intelligibles sauf par leurs interrelations avec les autres éléments. Cette relation constitue une structure''.

Les éléments linguistiques en morphologie sont les morphèmes. Adegboku (2017) affirme que le morphème est l'unité de base en morphologie. Nous avons deux types de morphèmes – les morphèmes liés (les morphèmes grammaticaux) et les morphèmes libres (les morphèmes lexicaux). Ces deux éléments linguistiques ont une relation. Les marques du pluriel en isoko sont les morphèmes liés tandis que les noms sont les morphèmes libres. Le structuralisme est lié à notre travail parce que la combinaison d'un morphème libre et une marque du pluriel en isoko est une relation donc forme une structure. Par cette notion, nous voyons que le structuralisme est très important dans ce travail.

Objectif général de l'étude

L'étude vise à mettre en relief aux différentes formes et marques de pluriel et le processus de pluralisation de noms en isoko.

Objectifs spécifiques de l'étude

(i) Pour examiner toutes les formes de pluriel qui existent dans la langue isoko.

(ii) Pour examiner le processus de pluralisation avec l'intention de faire ressortir les marques de pluriel pour l'étude scientifique de la langue isoko.

(iii) Pour énumérer les formes et les marques de pluriel en Isoko tirées de l'étude pour l'apprentissage de l'aspect de la pluralisation des noms en isoko.

(iv) Pour identifier les marques de pluriel qu'on n'a pas encore reconnu par les auteurs et les membres de la communauté linguistique d'isoko.

Les formes du pluriel et la pluralisation des noms en isoko.

La pluralisation en Isoko suit le processus de la préfixation. Selon Larousse (2009) cité par Agbagbatu (2014), la préfixation est le processus linguistique d`attacher un affixe (préfixe) à la fin d'un mot ou le radical. Le fait particulier de pluralisation des noms en isoko reste que la langue n'utilise que les voyelles à la pluralisation. Tous les noms en isoko sont commencés par les voyelles. Donwa-Ifode (2005), Okedi, Agbada et Omukoro (2020), Udumubrai, Othihiwa et Ovie (2016) notent que la forme du pluriel en Isoko est le remplacement de la voyelle initiale du nom par la marque du pluriel. Par exemple:

Singulier	**–**	**pluriel**	**français**
ọpia	-	**ị**pia	une machette / des machettes
avbae	-	**ị**vbae	un lac/ des lacs
ọbụ	-	**ị**bụ	un médecin/ des médecins
ovię	-	**ị**vię	une chaussette / des chaussettes
ufi	-	**i**fi	une corde / des cordes
orię	-	**i**rię	un palmier / des palmiers
owhọ	-	**a**whọ	une personne /des personnes
oma	-	**a**ma	un corps/ des corps
okọ	-	**e**kọ	une profession/des professions
ágbá	-	**e**gbá	une calebasse/ des calebasses

Nous constatons les préfixes suivant qui aident à la pluralisation des noms dans la langue; **a-**, **i-**, **e-**, **ị-**. Parmi les quatre voyelles servant la fonction du pluriel en isoko, le morphème de base de la pluralisation en Isoko est ‘’**ị-** ou **i-** ‘’ et la plupart de noms en isoko utilisent le préfixe ‘’ **i-** ‘’ au pluriel, les autres (**a-**, **e-**,et **ị-**) sont des allomorphes ou les formes variantes. Nous avons présenté toutes les règles de pluralisation en isoko pour examiner les formes de pluriel en isoko avec des exemples.

Règle Numéro 1: en général, la règle de pluralisation est d’attacher un préfixe **i-** à la position initiale du nom en remplaçant ou substituant la voyelle à la position initiale du nom. Eg **o**gbe (sing.) – **i**gbe (pluriel).

Règle Numéro 2:- les noms commencés par **a-** prennent **ị-** au pluriel eg. **a**kaba (sing) – **ị**kaba (plu),
akpala (sing.) – **ị**kpala (plur.)

Règle Numéro 3:- les noms commencés par **u-** prennent **i**- au pluriel eg **u**vbou (sing) – **i**vbou (plu),
uru (sing.) – **i**ru (plur.), uvi (sing.) – **i**vi (plur.)

Règle Numéro 4:- les noms commencés par **ẹ-** prennent **ị-** au pluriel eg. **ẹ**mị (sing.) – **ị**mị (plur.),
ẹkpa (singulier) – **ị**kpa (plur.). Exception: **ẹ**koko – **i**koko, **ẹ**kere – **i**kere.

Règle Numéro 5:- les noms commencés par **ọ** prennent **ị-** au pluriel eg. **ọ**kpọ – **ị**kpọ, **ọ**mọ – **ị**mọ
ọtọ - **ị**tọ.

Règle Numéro 6:- les noms commencés par **ụ** prennent **ị-** au pluriel eg. **ụ**ria – **ị**ria, **ụ**nwa – **ị**nwa

Règle Numéro 7:- les noms commencés par **o** prennent **i**- au pluriel eg **o**du – **i**du, **o**fe – **i**fe.
Exception: **o**la - **ị**la, okọ - **e**kọ, **o**tọ - **e**tọ, **o**va - **ị**va.

Règle Numéro 8:- les noms commencés par **e** prennent **i**- au pluriel eg **e**kpe – **i**kpe, **e**gho – **i**gho

Règle Numéro 9:- les noms commencés par **u** prennent **i-** au pluriel eg **u**si – **i**si, **u**mu – **i**mu

Règle Numéro 10:- les noms commencés par **o** prennent **ị-** au plural eg **o**gba – **ị**gba, **o**tọ - **ị**tọ

Règle Numéro 11 les noms pluralisés par **a-** eg obọ/ụbọ - **a**bọ, owho – **a**who, oma – **a**ma, **ẹ**rụ - **a**rụ, **o**vbọ - **a**vbọ.

Règle Numéro 12 les noms pluralisés par **e-** ókpá – **e**kpá, óza - **e**za, **á**gbá - **e**gbá, ọdọ - **e**dọ

Règle Numéro 13 les noms qui ont les mêmes formes singulières et plurielles eg ite – ite, efe – efe.

Règle Numéro 14 les noms avec les pluriels irréguliers eg eri – **iye/i**yei, aye - **ịya** /**ịyae**

Les autres types de pluriel en isoko.

Dans la langue isoko, il existe le préfixe **ọmọ-** ou **omo-** qui a la forme plurielle **ịmị-** ou **imi-** qui signifie ‘peu’ ou quelque chose petite ou quelqu’un jeune qui sert le préfixe de pluriel dans certains cas de noms dans la langue. Ce préfixe **ọmọ-** ou **omo-** avec la forme plurielle **ịmị-** ou **imi-** est un préfixe qui représente le sens diminutif de certains noms dans la langue. Tels noms, subissent certaines transformations linguistiques et morphologiques lorsque le morphème **omo-** ou **ọmọ-** sont préfixés aux noms; c’est-à-dire les changements au niveau orthographique et au niveau phonologique.

Nous constatons les formes suivantes: **ama-**, **eme-, umu-**, **omo-** et **ọmọ-**. Ces formes sont les allomorphes du morphème **omo-** qui est la forme singulier des préfixes **imi-** et **ịmị-**. Nous observons que, quoi que soit la manifestation de la forme singulière, la forme plurielle respecte toujours la règle de la pluralisation de noms dans la langue isoko.

La forme du pluriel du radical détermine la forme du pluriel du préfixe **omo-**, que ce soit **ịmị-** ou que ce soit **imi-**. C'est la raison pour laquelle nous avons **amabọ** au lieu d' **ịmịbọ** ou **imibọ** parce que le nom 'obọ' a la forme plurielle ''**a**bọ''. C'est la voyelle initiale 'a' qui commence le nom 'abo' au pluriel qui a nécessité la forme plurielle du mot 'amabo' lorsque le préfixe diminutif est attaché au nom ''abo''.

Cette forme de pluriel **ịmị-** change suivant la forme du pluriel du radical auquel le préfixe **ịmị-** est attaché. Cela veut dire qu'il y a un type d'accord entre la première et la dernière voyelle de la forme plurielle du préfixe **ịmị-** qui changent selon la voyelle initiale de pluriel du radical. Donc, nous avons les préfixes **ịmị-. eme-, ama-** et **imi-** comme les morphèmes de pluriel. en isoko. Nous présentons les exemples suivants:

Tableau 1: Une table de quelques noms dans la langue isoko formant leurs pluriels en **ịmi-**, **imi-**, **eme-**, et **ama-**

Isoko (singulier)	**Français (sens)**	**Isoko (pluriel)**	**Français (sens)**
ọtẹ ọmọtẹ	La fille La fillette	**ị**tẹ **ịmị**tẹ	Les filles Les fillettes
ọdọ ọmọdọ	Le ver le petit ver	**e**dọ **eme**dọ	Les vers Les petits vers

Uvbou umuvbou	La maison La maisonnette	Ivbou **imi**vbou	Les maisons Les maisonnettes
obọ omobọ	La main La petite main	**a**bọ **ama**bọ	Les mains Les petites mains

Source: Agbagbatu Vincent 2023

Le pluriel des noms composés

Nous avons deux types de noms composés en isoko. Ce sont les noms composés écrits comme un seul mot et les noms composés écrits en plusieurs mots. Il y a beaucoup de noms composés dans la langue. La majorité de ces noms est les noms composés écrits comme un seul mot. Nous constatons les noms composés de groups suivants: [(i) un nom plus un nom, (ii) un nom plus un verbe (iii) un nom plus un adjective].

Les noms composés (nom + nom)

Les noms composés en isoko à la forme plurielle, subissent quelques modifications orthographiques et linguistiques au cours de la combinaison des mots divers qui forment les noms composés. Ces modifications sont possibles grâce au fait que chaque nom de la langue est commencé ou terminé pas une voyelle. Nous présentons les exemples suivant des noms composés en isoko qui sont la combinaison des deux noms dans le tableau suivant.

Tableau 2: Une table de quelques noms composés (nom + nom) en isoko et leurs pluriels

Isoko (singulier)	**Français (sens)**	**Isoko (pluriel)**	**Français (sens)**
ọgba ẹmị ọgba + ẹmị ọgba-ẹmị ou ọgbẹmị	Le Guerrier Le mot Le bavard	 ịgba-ịmị ou ịgbịmị	 Les bavards
olori ozere olori + ozere olorizere	Le seigneur Le prête Le chef des prêtes	 ilorizere	 Les chefs des prêtes
ọbụ imu ọbụ + imu ọbụ-imu	Le médecin La médecine Le médecin	 ịbụ-imu	 Les médecins
uzou ẹmi uzou + ẹmị uzo-ẹmị/uzẹmị	La tête L’affaire La vérité	 uzẹme	 La vérité

uvbou imu uvbou + imu uvbo-imu ou uvbuimu	La maison Le médicament L'hôpital	 ivbo-imu ou ivbimu	 Les hôpitaux

Les noms composés (verbe + nom)

Les noms composés en isoko qui sont la combinaison d'un verbe et un nom (verbe + nom) suivent un procédé. Un agent 'o', 'u', ou 'ụ' est tout d'abord attaché au verbe avant le commencement du processus de pluralisation du nom composé. Ce processus n'est que possible parce qu'on ne pluralise pas les verbes comme on pluralise les noms en isoko. Les noms composés (verbe + nom) forment leurs pluriels en pluralisant parfois l'agent et dans certains cas on pluralise l'agent et le nom à la fois. Voilà les exemples suivants dans la table ci-dessus

Tableau 3: Une table de quelques noms composés (verbe + nom) en isoko et leurs pluriels

Isoko (singulier)	**Français (sens)**	**Isoko (pluriel)**	**Français (sens)**
gbẹ edhere ọgbe + edhere ọgbedhere	Dégager La route	 ịgbedhere ou ịgbidhere	 Les nettoyeurs de la route

	Le nettoyeur de la route		
kpare udi ụkpare + udi ụkparudi	Ouvrir/casser La boisson Un décapsuleur	 ịkparudi ou ịkparidi	 Les décapsuleurs
si ame ụsi + ame ụsiame	Retirer L'eau La corde	 isiame	 Les cordes
dhẹ okọ ọdhẹ + okọ ọdhoko	Conduire Le bateau Le chauffeur	 ịdhokọ ou ịdhịkọ	 Les chauffeurs
gba ivie ogba + ivie	Lier Les seins		

ogbivie	Le soutien-gorge	ịgbivie	Les soutiens-gorge

Les noms composés **(**nom + adjectif)

Les noms composés **(**nom + adjectif) dans la langue sont pluralisés suivant la modèle de pluralisation des noms en isoko. En isoko, les adjectifs ne prennent pas les marques du pluriel, c'est seulement les noms qui prennent les marques du pluriel. Le mot 'omo' qui signifie un ''enfant'' est considéré aussi comme un préfixe diminutif. Le pluriel est 'ịmo' et parfois ''ịmị'' quand le mot 'omo' signifie 'peu' ou ''petit'' comme nous trouvons dans les exemples suivants d'ọmọsịsị et ịmịsịsị dans le tableau ci-dessus.

Tableau 4: Une table de quelques noms composés (nom + adjectif) en isoko et leurs pluriels

Isoko (singulier)	**Français (sens)**	**Isoko (pluriel)**	**Français (sens)**
ọmọ ọmọ + ọsịsị ọmọsịsị	L'enfant petit L'enfant	ịmịsịsị	Les enfants
ọka ọboba ọka + ọboba ọkaboba	Le maïs Frais Le maïs	ịkaboba ou ịkịboba	Les maïs frais

Ara ọkpokpọ ara + okpokpọ arakpokpọ	La viande Cru La viande crue	ịraokpokpọ	Les viandes crues
ọdiọ ologbo ọdiọ + ologbo ọdiologbo	Le chef Grand Le premier ministre	ịdiọlogbo	Les premiers ministres

La conclusion

En conclusion, nous constatons que le processus de la pluralisation des noms en isoko est par l'affixation. Les types d'affixes utilisés sont les préfixes, donc la langue se sert le procédé de préfixation à la pluralisation des noms en isoko. Nous notons qu'il y a plus de deux marques de pluriel ou les morphèmes de pluriel en isoko. Basé sur les données présentées dans ce travail nous constatons qu'il y a quatre (4) morphèmes de pluriel **i-**, **ị-**, **a-** et **e-** au lieu de deux marques de pluriel reconnu par les auteurs qui ont établi avant ce travail, qu'il y a seulement deux marque de pluriel **i-** et **ị-** dans la langue isoko. Nous avons constaté aussi qu'il existe certains marques de pluriel diminutives comme **imi-**, **eme-**, **ama,** et **ịmị-** que nous avons trouvé dans certains noms composes utilisant les préfixes diminutifs **omo-**, **ọmọ-** et **omụ-** au singulier dans la langue. La langue possède les noms indénombrables ou les noms incomptables qui sont les noms qui ne portent pas les marques de pluriel. Il y a les noms irréguliers dans la langue qui sont très peu en nombre qu'on ne peut pas pluraliser suivant les formes régulières de pluriel comme aye - **ịya**/**ịya**e ou **e**y**a**/**e**y**a**e, (une femme - des femmes) eri – **iye** ou **iye**i (un poisson - des poissons).

Recommandations

(i) Il faut recommencer avec intensité le programme éducatif sur la notion du pluriel en isoko dans tous les écoles à tous les niveaux d'étude de la langue pour corriger l'assomption qu'il y a seulement deux morphèmes de pluriel en isoko **i-** et **ị-** au lieu de quatre morphèmes **i-**, **ị-**, **a-** et **e-** comme nous avons trouvé dans cette recherche.

(ii) Les formateurs des politiques pédagogiques au Nigéria spécifiquement en isoko qui fait partie de l'Etat de Delta devraient formuler les politiques éducatives qui peuvent faciliter l'étude de la langue isoko au domaine de la pluralisation des noms

(iii) L'église, les écrivains, les enseignants, les membres du gouvernement municipal d'isoko devraient travailler ensemble pour réaliser le but de la durabilité d'isoko pour éviter son extinction comme Williamson (1999) et Itiveh et Omeke (2016) sont prévenus concernant les langues africaines au bord d'extinction.

(iv) Les membres de la communauté linguistique d'isoko devraient travailler très dur pour développer la langue isoko jusqu'au niveau de la compétition avec les langues nigérianes comme yoruba, hausa ibo, et les langues internationales surtout les langues européennes - le français, l'espagnol, l'allemand, l'italien, le portugais etc.

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COMPARATIVE ANALYSIS OF TURN-AROUND TIME AMONG SELECTED SEAPORTS IN WEST AFRICAN SUB-REGION

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ABSTRACT

The study presents a comparative analysis of turnaround time among selected seaports in West African sub-region. Using Lagos Ports Complex with Apapa Port in Nigeria as a representative and Cotonou Port in Benin Republic, the study exposes in details the challenges and inefficiencies inherent in Apapa Ports Complex in Nigeria that make Nigerian shippers move their cargoes through Cotonou Port to Lagos market. In the last decade, inter-port competition in West Africa has become fiercer as captive hinterlands of ports continue to overlap and become contestable or shared. This is due to door-to-door supply chain services being offered by shipping lines and third party logistics service providers through inter-modalism. The specific objectives assessed how port infrastructure influences cargo throughput, assessed how port infrastructure influences ship traffic, examined the relationship between navigational channel and berth occupancy, determined the influence of Ship-To-Shore handling equipment (STS) on vessel turnaround time and examined the relationship between Automated Loading System (ALS) and cargo dwell time. The target population for the study is the Nigerian Ports Authority, Nimasa, Port Authority of Cotonou and terminal operators. Random sampling was used to select three hundred and seventy one (371) respondents using the Taro Yamane formula. Primary and secondary data were used for this study to achieve this aim. The statistical tools used for the study are the frequency table, graph, Pearson Product Moment Correlation (PPMC), and Ordinary Least Squares Regression (OLS), and the data obtained were analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. The findings show a positive relationship between port infrastructure and inward and outward cargo in West African Sub-region. An improvement in port infrastructure positively affects both inward and outward cargo. Also, both ships entering and leaving the port benefit from improvements to the port's infrastructure. There was a positive relationship between the established navigation channel and berth occupancy, ship to-shore handling equipment and turnaround time, and the automated loading system and cargo dwell time. Based on the study, it was recommended that the Nigerian Ports Authority prioritize the dredging of the navigational channel to accommodate larger ships for efficient and productive vessel operations, and the concessionaires should supply modern handling equipment and make sure that staff members receive periodic training so they can use modern equipment in a variety of ways. It becomes expedient to implement improved berth allocation policies to guarantee equitable vessel distribution and proper ship-to-berth matching.

Keywords: Ship-To-shore (STS) handling equipment, vessel turnaround time, port operations, terminal operators, Nigerian Ports Authority.

1.0 INTRODUCTION

Seaports play a significant role in the advancement of any nation accessible by sea or ocean and serve as the gateways for both domestic and international trade. Furthermore, 80% of the total world trade depends on maritime transport (United Nations Conference on Trade and Development, UNCTAD, 2009). Ports provide a basic means of integrating a regional or local economy into the global economic system. Basically, port functions as nodal point for cargo and passenger handling. Other functions include bunkering and repairs for ships, shelter for ships, provision of bases for industrial development as well as a major part of logistics chain (Branch, 1986). The concern of this study is the cargo handling aspect of port functions as this forms a major function that determines port's relevance; hence, its competitiveness in the global maritime trade system. Cargo flows within the port system can be classified basically into dry bulk, liquid bulk, containers, roll-on/roll-off and others (Ligteringen & Velsink, 2019) based on actual design of terminals (Jaja, 2018). The drybulk cargo include iron ore, coal, grain, wheat, cement, which are either discharged by the use of specialized equipment (Rodrique, 2019) such as grab bucket, or pneumatic pumps or conveyed by road or rail or through conveyor belts or elevators to silos for temporary storage. The liquid bulk includes commodities mostly classified as hazardous (Ligteringen & Velsink, 2018, pp. 171). They include crude oil, oil products, chemical products, liquefied gases and vegetable oil. Terminals for these types of cargo are usually composed of a pipeline, connecting the oil fields with the site of the terminal.

2.0 LITERATURE REVIEW

Queuing Theory

Queuing theory is a branch of mathematics that studies and models the act of waiting in lines. This paper will take a brief look into the formulation of queuing theory along with examples of the models and applications of their use. The goal of the paper is to provide the reader with enough background in order to properly model a basic queuing system into one of the categories we will look at, when possible. Also, the reader should begin to understand the basic ideas of how to determine useful information such as average waiting times from a particular queuing system.

The first paper on queuing theory, "The Theory of Probabilities and Telephone

Conversations" was published in 1909 by Erlang, now considered the father of the field. His work with the Copenhagen Telephone Company is what prompted his initial foray into the field. He pondered the problem of determining how many telephone circuits were necessary to provide phone service that would prevent customers from waiting too long for an available circuit. In developing a solution to this problem, he began to realize that the problem of minimizing waiting time was applicable to many fields, and began developing the theory further.

Erlang's switchboard problem laid the path for modern queuing theory. The chapters on queuing theory and its applications in the book "Operations Research:

Applications and Algorithms" by Wayne Winston illustrates many expansions of queuing theory and is the book from which the majority of the research of this paper has been done.

In the second section of this paper, we will begin defining the basic queuing model. We will begin by reviewing the necessary probabilistic background needed to understand the theory. They will move on to discussing notation, queuing disciplines, birth-death processes, steady-state probabilities, and little's queuing formula. In the next section we will begin looking at particular queuing models.

We will study the population size, the customer capacity, and the number of servers, self-service queues, and the machine repair model, to name a few. We will be calculating steady-state probabilities and waiting times for the models when possible, while also looking at examples and applications. We will conclude the paper by taking a peek at some field research studying the queuing system at a bank.

The Basic Queuing Model

To begin understanding queues, we must first have some knowledge of probability theory. In particular, we will review the exponential and Poisson probability distributions.

Exponential and Poisson Probability Distributions. The exponential distribution with parameter is given by $e{-}t$ for t 0. If T is a random variable that represents inter-arrival times with the exponential distribution, then

$P (T\ t) = 1 - e{-}t$ and $P (T > t) = e{-}t$.

This distribution lends itself well to modeling customer inter-arrival times or service times for a number of reasons. The first is the fact that the exponential function is a strictly decreasing function of t. This means that after an arrival has occurred, the amount of waiting time until the next arrival is more likely to be small than large. Another important property of the exponential distribution is what is known as the no-memory property. The no-memory property suggests that the time until the next arrival will never depend on how much time has already passed. This makes intuitive sense for a model where we're measuring customer arrivals because the customers' actions are clearly independent of one another.

It's also useful to note the exponential distribution's relation to the Poisson distribution. The Poisson distribution is used to determine the probability of a certain number of arrivals occurring in a given time period. The Poisson distribution with parameter is given by (t) Ne−tn! Where n is the number of arrivals. We find that if we set n = 0, the Poisson distribution gives use−t which is equal to P (T > t) from the exponential distribution.

The relation here also makes sense. After all, we should be able to relate the probability that zero arrivals will occur in a given period of time with the probability that an inter-arrival time will be of a certain length. The inter-arrival time here, of course, is the time between customer arrivals, and thus is a period of time with zero arrivals.

3.0 METHODOLOGY

The study tried to appraise factors responsible for cargo diversion to neighboring Ports by shippers in Nigeria using West African Ports of Cotonou in republic of Benin and Apapa Port in Lagos, Nigeria as study. The two Ports were chosen as case study. The two ports were chosen due to their closeness to each other in the same competitive region. Data collected was from both primary and secondary sources. To obtain the primary data, we conducted survey research design in both port of Cotonou and Apapa ports. The survey research design was very necessary to identify several factors that influence stakeholders/shippers choice of port for patronage.

A sample institute the finite portion of an arithmetic populace whose assets are considered to gain facts as per a whole (Webster, 1985)

Here, the sampling points will be the terminals in the port of Cotonou and port of Lagos. Simple random sampling technique is utilized to certify each unit of study populace is uniformly represented. Table 3.5 Target Population.

Given the limitation access to the entire elements of the population, Taro Yamane (1957)

Formula was used to estimate a sample size. The formula is thus

n = N

1 + N (e) 2

Where

n = sample size G

N = Population =

I = constant

E – The allowable error margin or tolerate error which will take as 5% (0.05)

5159n

n =1+5159 (0.05) 2

n = 371

4.0 RESULT

Information that were gathered and broken down for this exploration study were from essential source gotten from the questionnaire administered to the number of respondents in study area.

The questionnaire being the main instrument that was utilized for assessing and assembling of information was arranged into Section A (Socio-economic characteristics of respondents),

Section B (questions relating to the study objectives) and Section C (oral meetings inquires) with the authority of NPA and NIMASA).

Questionnaire were disseminated to Three Hundred and Seven One (371) respondents at the seaport, out of which Two Hundred and eight-five (285) duplicates properly filled were returned (76.82% returned rate), Fifty-five (55) duplicates of the returned duplicates were invalid (14.82%). Two Hundred and thirty (230) respondents framed the sample for this study. The information acquired are introduced in the different tables beneath and dissected in accordance with the research questions.

Objective (1) Ascertain turnaround time between Cotonou and Apapa Seaport

Table 4.1 Turnaround time between Cotonou and Apapa Seaport

Fig 4.1 Turnaround time

TURNAROUND TIME BETWEEN COTONOU AND LAGOS SEAPORT FROM 2012 TO 2020.

Year	Lagos Port	Cotonou Port
2012	13.69	8.19
2013	9.64	6.83
2014	6.00	5.77
2015	8.60	6.55
2016	9.37	8.05
2017	8.94	8.00
2018	6.70	3.26
2019	7.59	3.00
2020	6.70	2.26
TOTAL	77.27	51.81

Source: NPA Annual Bulletin (2021)

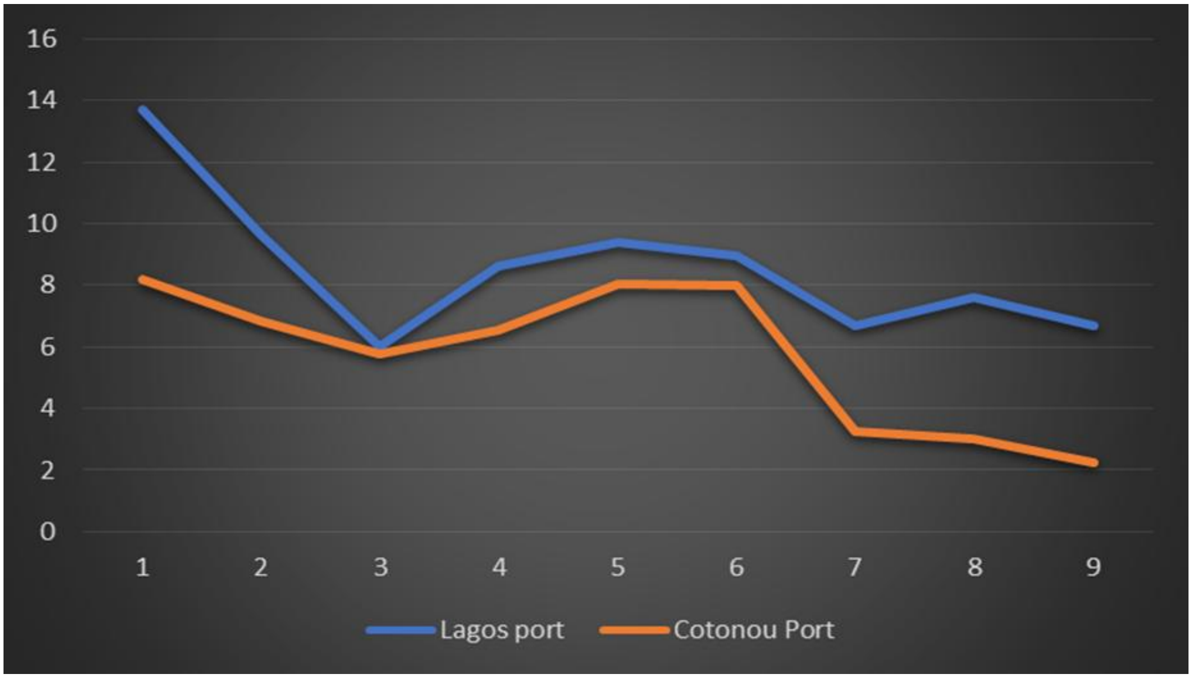
Table 4.4 shows the total turnaround time of vessel from the year 2012 to 2020.

It was shown that the average time that vessel at ports varies from 2012 to 2020.

Fig 4.1 shows the trend of vessel turnaround time across the two ports.

It was shown that vessels spend more time at Apapa port more than Cotonou port, the trend shows a downward decline of vessel turnaround time from the year 2018.

VARIATION BETWEEN LAGOS AND COTONOU PORTS BETWEEN 2012 TO 2020



Source: Field Survey: 2023

Turnaround time of vessel at Lagos and Cotonou ports

4.1.3 Relationship between crane operations on ship turnaround time Lagos and Cotonou port

Table 4:5 relationship between crane operations on ship turnaround time Lagos and Cotonou port?

Turnaround time of vessel at Lagos and Cotonou ports

Table 4.5 shows the relationship between crane operations and ship turnaround time at Lagos and Cotonou ports. It was discovered that old cranes and breakdown of cranes affect the turnaround time of vessel with the mean of 2.76 and 3.03 which led to the increase in waiting time of the vessel with the mean of 3.08 and inadequate manpower with the mean of 2.4 across

Table 4:6 Factors responsible for variation in turnaround between the two ports

RELATIONSHIP BETWEEN CRANE OPERATIONS ON SHIP TURNAROUND TIME IN LAGOS AND COTONOU PORT

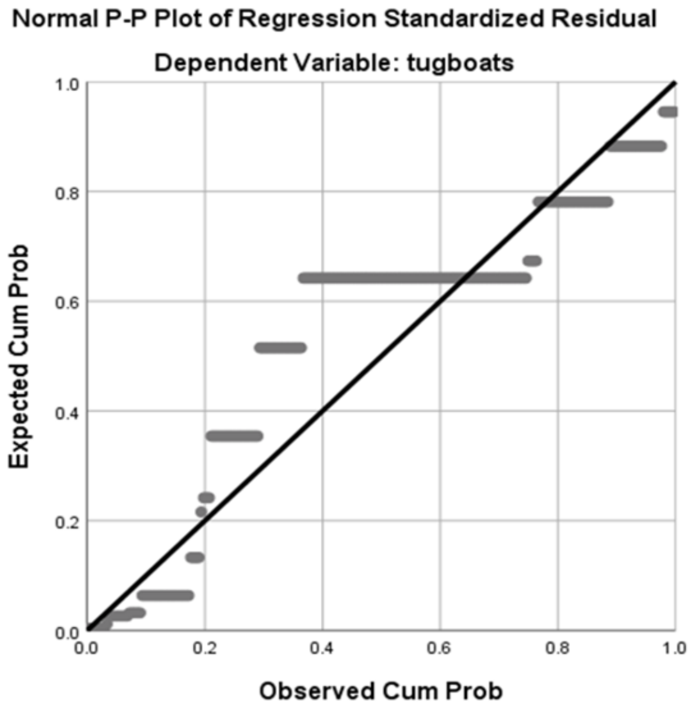


Table 4.5 shows the relationship between crane operations and ship turnaround time at Apapa and Cotonou ports. It was discovered that old cranes and breakdown of cranes affect the turnaround time of vessel with the mean of 2.76 and 3.03 which led to the increase in waiting time of the vessel with the mean of 3.08 and inadequate manpower with the mean of 2.4 across

Table 4:6 Factors responsible for variation in turnaround between the two ports

FACTORS RESPONSIBLE FOR VARIATION IN TURNAROUND TIME BETWEEN LAGOS AND COTONOU PORTS

S/N0	Variation	SA(4)	A(3)	D(2)	SD(1)	Mean	Decision
1	Port Congestion	151 (604) 1st	68 (204) 2nd	10 (20) 3rd	1 (1) 4th	360	Accepted
2	Load/Unloading Speed	184 (604)	30 (90)	7 (14)	9 (9)	3.69	Accepted

		1st	2nd	3rd	4th		
3	Method of Cargo handling	97 (388) 1st	126 (378) 2nd	5 (10) 3rd	7 (7) 4th	3.52	Accepted
4	Pilotage and Mooring	137 (712) 1st	82 (246) 2nd	4 (8) 3rd	6 (6) 4th	3.14	Accepted
5	Delay due to weather	178 (712)	29 987	13 (26)	10 (10)	3.63	Accepted
6	Inadequate dock labor	97 (388) 1st	126 (378) 2nd	5 (10) 3rd	2 (2) 4th	3.38	Accepted

Source: Field Survey: 2023

Hypothesis 2

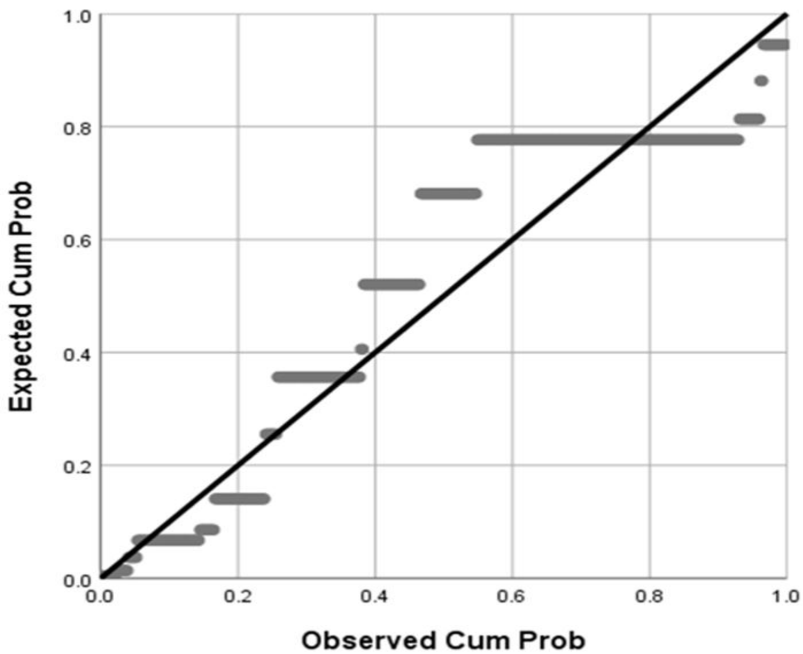
ANOVA a

Model	**Sum of Square**	**DF**	**Mean Square**	**F**	**Sig.**
1Regression	26.455	1	26.455	35.006	.000b
Residual	172.310	228	756		
Total	198.765	229			

a. Dependent Variable: tugboats

b. Predictors: (Constant), policy

FACTORS RESPONSIBLE FOR VARIATIONS OF SHIP TURNAROUND TIME ACROSS LAGOS AND COTONOU PORTS



The result from table 4.6 showed factors responsible for variations of ship turnaround time across the two ports. It was discovered that port congestion with the mean of 3.60 loading/unloading speed with the mean of 3.69.

Method of cargo handling with the mean of 3.52, Pilotage and mooring with the mean of 3.14.Delay due to weather with the mean of 3.63 and inadequate dock Labor with the mean of 3.38 are factors causing variation.

In terms of service delivery across the two ports. It was generalized that loading and unloading speed and delay congestion. Delay due in weather are the major causes of variation of turnaround time across the two ports.

THE IMPACT OF BERTH OCCUPANCY ON SHIP TURNAROUND TIME ON STATEMENT OF LAGOS AND COTONOU PORTS?

S/no	Impact of berth occupancy on ship turnaround	SA (4)	A (3)	D (2)	SD (1	Mean	Accepted
1	Terminal Efficiency	104 (416) 1st	87 (261) 2nd	12 (24) 3rd	27 (27) 3rd	3.17	Accepted

2	Dredging Operation	161 (644) 1st	39 (117) 2nd	17 (340 3rd	13)13) 4th	3.51	Accepted
3	Increased rate of turnover	68 (272) 2nd	111 (333) 1st	25 (50) 3rd	26 926) 4th	2.96	Accepted
4	Equipment Utilization	70 (280) 2nd	136 (4080 1st	20 (40) 3rd	4 (4) 4th	3.18	Accepted
5	Operational cost for the ship operator & chatterers	14 (56) 4th	66 (198) 1st	49 (98) 3rd	101 (101) 2nd	1.97	Rejected
6	Labor Efficiency	177 (708) 1st	22 (66) 2nd	26 (52) 3rd	5 (5) 4th	3.61	Accepted

Author's Field Survey: 2023

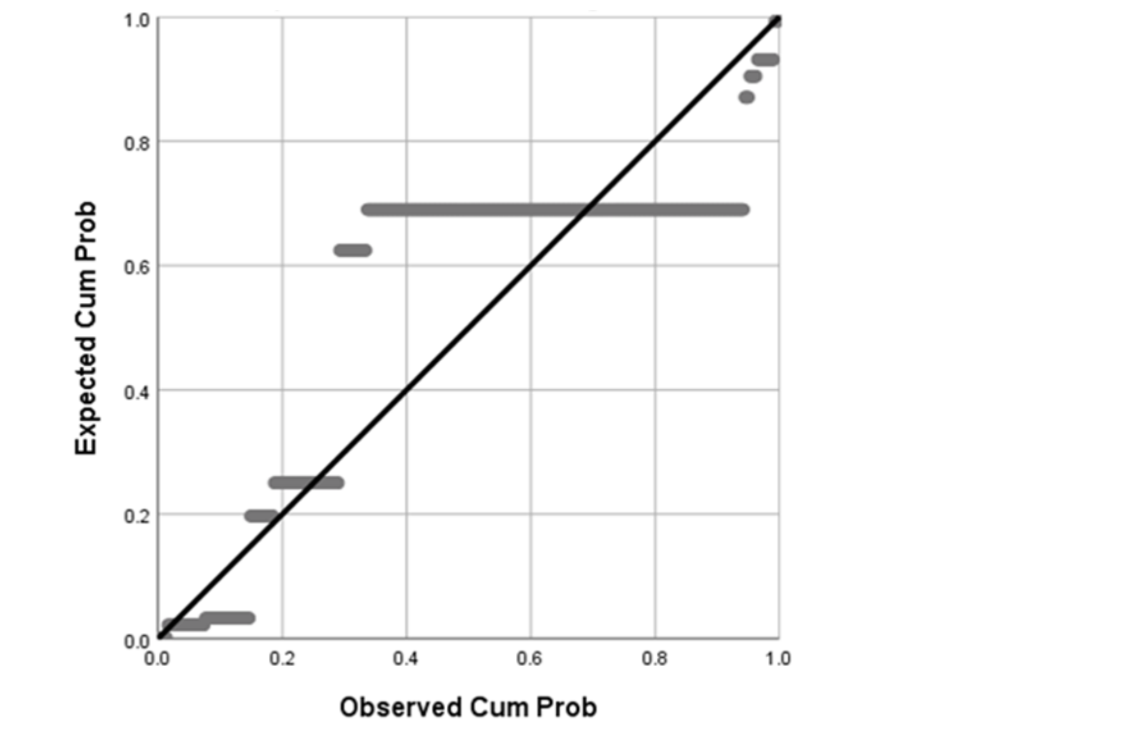
Table 4.7: What is the impact of berth occupancy on ship turnaround time on statement of the two position?

Hypothesis 3

ANOVA a

Model	Sum of Squares	DF	Mean Square	F	Sig.
1Regression	95.697	1	95.697	130.902	.000b
Residual	360.412	493	.731		
Total	456.109	494			

THE IMPACT OF BERTH OCCUPANCY



Objective four

The result from table 4.7 showed the impact of berth occupancy on ship turnaround time. It was discovered from the findings that terminal efficiency with the mean score of 3.17 dredging operations with the mean of 3.51, increase rate of turn over with the mean score of 2.96, Equipment utilization with the mean score of 3.18, operational cost of the ship operation with the mean score of 1.97 and Labor efficiency with mean score of 3.61influenced by ship turnaround time. It was generalized that dredging operations and Labor efficiency are the major factors influencing ship turnaround time.

Hypothesis 4

OPERATIONAL COST OS SHIPS OPERATION

ANOVA a

Model	Sum of Squares	DF	Mean Square	F	Sig.
1Regression	87.177 1	1	87.177	178.122	.000b
Residual	111.588	228	.489		
Total	198.765	229			

a. Dependent Variable: berth

b. Predictors: (Constant), tugboats

4.2 Discussion of Findings.

The findings showed that the average time that vessel spent at the port varies from 2012 to 2020. It was discovered that vessel spend more time at Apapa port that Cotonou (Benin Republic and Lome (Togo) is less than 24hrs compared to Nigerian Seaports, they further asserted that ship turnaround time presently is between 7 to 14 days highest turnaround time in West Africa, and made Nigerian ports unattractive for transit cargoes.

Furthermore the findings show the relationship crane operations and ship turnaround time at Apapa and Cotonou. It was discovered that old cranes affect the turnaround time of vessel

The study agreed with Mogbojuri et al (2023) who asserted that ship-to shore handling equipment upgraded with speed up vessel turnaround time at the port.

Factors affecting the turnaround time in a seaport, number of containers moves cranes intensity, cross crane intensity, gross crane productivity, berth productivity and number of quay cranes were identified as the key affecting factors, while recognizing the importance of the time related variables such as berthing delay, idle time, productive time and vessel.

The impact of berth occupancy on ship turnaround time on statement for the two positions. The berth performance indicators concern the calculation of the ship waiting time and its time in port. A problem is to ensure optimum use of the berths in the port insufficient berth capacity will be a waste of port capital and resource.

The main indicators used to assess berth performance are:

(1) Berth throughput

(2) Waiting time

(3) Service time

(4) Time in port

(5) Grade of waiting

(6) Berth occupancy ratio

(7) Berth working time ratio

Handling operation indicator is when assessing berth performance only the port on berth infrastructure is concerned in handling operations three sets of resources are considered namely ship/shore handling equipment. Yard transfer-equipment and the labor-force the indicator which are (1) working ship output= Total tonnage handle (tonnes) ship hour worked/Total hours worked are frequently used for the measurement of performance of the handling operations because of the performance of handling operations because of peak situations it is preferably to calculate the ration on a monthly or a daily basis, as the yearly average does not show the periods when the problem happen.

5.0 CONCLUSION AND RECOMMENDATIONS

African ports have gained popularity over the years due to port management partnership. Port Durban is the busiest port in Africa, while Port Richards Bay, located quite close to the former, is one of the largest ports in the world. The Suez Canal Container Terminal is located at Port Said, one of Africa's most modern ports. Lagos, Nigeria's economic capital, has some of the most famous ports in West Africa, and it is divided into two sections, the Tin Can Port and the Apapa Wharf. While the Lekki Deep Seaport, also in Lagos, is under construction. Unfortunately, other seaports in Nigeria are not working optimally. There is an overused cliché that Nigerians are hardworking and the country is well-endowed with human resources.

It is true, however, due to incessant gridlock at Lagos seaports, it has been realized that hard work does not automatically translate to productivity. Most Nigerians working at Lagos seaports, either to export goods or clear imported goods, are currently under physical and mental stress. This makes the gifted human resource hypothesis invalid in terms of productivity in Nigeria's maritime industry, as most Nigerians operating at the Lagos seaports find it challenging to access their work places, more than a decade ago, and the federal government reformed Nigerian ports to increase efficiency and productivity. A few years after the port reforms, a marginal improvement in cargo recorded at, number of vessels, berthing facilities, and turn-around time for ships was experience. Despite the modest achievements recorded at Lagos seaports and others due to the reform, poor infrastructure on land is currently reversing the gains as imported goods cannot be cleared within a short period.

The paradox of Lagos seaports is that the port reforms have not enhanced productivity within the nation's manufacturing sector but has stifled economic growth. Despite the potential and various investment opportunities, the nation's maritime sector has not considerably attracted the required local and foreign inflows proportionate to its contribution to the Nigerian economy. This is not only due to policy flip-flops but also poor infrastructure within the seaports. Available data shows that Lagos seaports can roughly to 70 percent of all cargo traffic in Nigeria. Nowadays, it is evident that the poor state of infrastructure inside and outside the Lagos seaports is one of many reasons why the ports are not as efficient as they ought to be in handling cargo traffic.

5.3 Recommendations

Based on the findings, the following are recommended:

(i) The Nigerian Port Authority should beef up the provision of adequate and efficient modern port facilities to facilitate quick ship service and reduced ship turnaround time.

(ii) The Nigeria Port Authority should also set an internal quality service system that enhances shorter ship turnaround time.

(iii) Government should review and monitor the activities of the regulatory bodies operating in the ports.

(iv) Government should also improve the inland transport system in terms of efficiency and connectivity to the ports.

(v) The ports should seek to establish virile research and planning unit whose sole duty shall be to gather, analyze and interpret port statistics, which will serve as the basis for every strategic decision

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EVALUATION OF SHIP TRAFFIC RATE PERFORMANCE OF NIGERIAN EASTERN PORTS

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Abstract
This study evaluates the differences in ship traffic rate among Nigeria Eastern. The Eastern Nigeria Ports comprises of Onne Port Complex, Rivers Port Complex, Calabar Port Complex and Delta Port Complex. Due to the staggering growth overtime recorded from the limited number of foreign vessels handled by the Nigerian Eastern ports, the ports were stigmatized with issues such as insecurity, which are not limited to the problem of militancy, terrorism, sea pirates that led to increases in shipping operational cost. It is expensive to combat these crimes, as vessels and cargo owners often engaged the services of armed security guards (Nigerian Navy) to secure the vessels that trade in this region. The region is also affected with the problem of low berths and shallow channel, especially for Calabar port and Delta port. Secondary data were obtained from the Nigerian Ports Authority (NPA) from 2018 to 2022.The descriptive analysis used in the study revealed that, ship traffic rate differs between Nigerian Eastern Ports. A one-way Analysis of Variances (ANOVA) was used to test the differences in ship traffic rates performance. Findings revealed that there is a statistical significant difference in ship traffic rate among Nigeria Eastern seaports, with F value of 111.173 and P value at 0.00. The study concluded that Onne port performed higher, follow by Rivers port, Calabar port and Delta port respectively. It was recommended among others that the ports channels should be dredged, especially for Delta and Calabar ports, so that bigger vessels can navigate to berth.

Keywords: Ship traffic rate, Number of Vessels Handle and Port Performance

Introduction

International shipping trade, shipped over 90% overall cargo throughput (tonnages) through seaports, the higher the volume of exports/imports cargoes trades globally, the higher the ship traffic rates (UNCTAD, 2012). These shipments are usually shipped in bulk carrier ships, containerized ships and break bulk carriers to connect the ocean routes through the link of seaports serving as the source of global trading, as the 70% of the traded cargoes are handled by the seaports globally from which maritime nations earned huge revenue. Ship traffic rates in global shipping directly influence the seaport channel links depending on the size of the ship that approaches the seaport channels and the ability to handles higher number of ships at a particular period of time.

Seaports are very important to shipping developments in logistics supply chain systems and are at the forefront of the national and regional trading industries. The performance of ports in logistics systems is significant to the development of the shipping industry. Most of the ports client focuses on the quality and reliability of services delivery in the entire logistics network, instead of just the basic sea-to-land connectivity (Notteboom, 2006). Thus, shipping trade activities are depending so much on the port performance of the country. Shipping operations for example, is profitable for the country compared to production of the goods locally due to the limited resources (Ewuzie, 2018).

The Nigeria Ports Authority operate both as the Western Ports that comprises of the Apapa port, Tincan port and most recently the Lekki deep port; Eastern ports on the other hand also comprises of the Onne port, Port Harcourt Port, Calabar port and Warri port. The Nigerian Eastern port was established to serve as the local hub area for traders within the location of the south-south region of Nigeria, to ease the pressure of trading in export and import through international shipping trades. The seaport contributed to the growth of Nation economy by connecting the local traders in international trading to transport liquid bulk, dry bulk, general cargo and containerized cargo. The Nigerian Eastern ports served the oil rich region with good numbers of service boats that helps in transporting and conveying liquid bulk cargo (feeder's ships) to the mother ship mostly as supplies.

Ship traffic rate of the Nigerian Eastern ports are declining in recent years compare to the ship traffic rate of previous years among the Nigerian Eastern ports due to the constant changes in exchange rates as well as the scarcity of dollars. However there was an increase in gross register tonnage (GRT) as the shippers opted for bigger ships that can produce economic of scales in shipping larger cargoes with less number of ships. The increase in the size of ships trading in Eastern Nigerian port improve the working hours of the stevedoring agencies and helps local traders, carriers, and shippers to save money on port clearing tariff, infrastructural investments, cost of transportation, expenditures on ships, and inventory holding costs of merchandise goods. These cost reduction encourage low engagement of more shipping operation by port users as terminal operator often increases handling cost per ships, mooring/unmooring cost, towing pilotage charges and other charges accompanied by the berthing of individual ship to the prices of imported finished goods and export raw materials in the various economies to bring about a multiplier effect that reduces inflation rates and improves the living standard of the general society.

Ship traffic rate among the Nigeria Eastern port varies between local ships and foreign vessels, although suffers a downward decline in numbers of foreign ships due to global economic recession caused by Covid 19 pandemic, but shown expansion in 2022 shipping trade with the adoption of bigger vessels which was latter affected by the Russia and Ukraine conflict which came as a challenge for number of vessels handles by port globally.

The evaluation performance shows that ship traffic rate at the Nigeria Eastern port suffers a downward slide from 2018 as compare to 2017, having recorded 2.3% decline in number of ships handle and 2.8% on ship gross register tonnages as more service boats with low GRT were recorded at some ports and issues of transshipment of cargo from port premises to the cargo owner warehouses due to the poor state of port infrastructures, such as the access road that link the port to the location of the shipper (UNCTAD, 2020).

Materials and Methods

The study area is the Nigeria Eastern Seaport that comprises of Onne port with West Africa Container Terminal (WACT), Integrated Logistics Services (INTELS), Brawal Oil Services Limited and Onne Multipurpose Terminal (OMT), Port Harcourt port with BUA and Ports and Terminal Operators Nigeria Limited (PTOL), Delta port with Julius Berger, Integrated Logistics Services (INTELS), Associated Maritime and Ocean & Cargo and Calabar Ports with Ecomarine terminals Limited, Integrated Logistics Services (INTELS) and Shoreline Logistics Nigeria Limited all situated at the south-south geopolitical zone of Nigeria.

Method of Data Analysis

The study employed the use descriptive statistics to treat the data extracted from the Nigerian Ports Authority. The descriptive statistics used were tested using the one-way analysis of variance (ANOVA) in testing the hypothesis. Nigeria Port Authority (NPA) data show the level of differences in ship traffic rate among the Nigeria Eastern ports. Five years data were presented to assess the annual performances recorded from 2018, 2019, 2020, 2021 and 2022 respectively by comparing the ship traffic rate port performance of Port Harcourt, Onne, Delta and Calabar ports.

Results and Discussions

Table 1: Delta Port Assessment on Ship Traffic Rate Performance

Terminals	Intels		Julius Berger		Associated Maritime		Ocean & Cargo	
Year	Vessels	GRT	Vessels	GRT	Vessels	GRT	Vessels	GRT
2018	2	14,532	36	316,428	20	552,591		
2019	1	7,975	56	485,976	20	499,976		
2020	-	-	39	318,856	28	408,287		
2021	21	594,492	35	415,045	20	614,135		
2022	26	421,575	60	537,283	14	412,563	1	4,150
Total	**50**	**1,038,574**	**226**	**2,073,588**	**102**	**2,487,552**	**1**	**4,150**

Source: *NPA Reports, Monitoring and Regulatory (2018-2022)*

Julius Berger recorded the highest number of ships berthed at the Delta port for the 2018 with 36 ships; AMS with 20 ships and a GRT of 552,591 and INTELS with 2 ships and a GRT of 14,532 as the least performing operator for 2018. The analysis of 2019 shows that Julius Berger recorded the highest number of berthed ships with a total ship of 56 and a GRT of 485,976, followed by AMS with 20 ships and 499,976 as well as the least INTELS with 1 ship and a GRT of 7,975. The 2020 analysis shows that JBN recorded 39 ships and 318,856 GRT as the highest performing Delta port operator, followed by the AMS with 18 ships and 408,287 GRT as INTELS recorded zero ship handling. The evaluation also revealed that 2021 best performing operator was JBN with 35 ships and a GRT of 415,045, followed by AMS with 20 ships and a highest GRT of 614,135 and a record of 21 ships and 594,429 GRT for INTELS. The ship traffic rate performance level of 2022 assessment shows that JBN recorded the highest record with 34 ships and a GRT of 537,283, followed by INTELS best performing record year with 26 ships, 421,575 GRT, followed by AMS with 20 ships and a GRT of 614,135 to record the biggest combine ship for the year and the least was recorded for newly commission Ocean and Cargo operator with 1 ship and a GRT of 4,150.

Table 2: Port Harcourt Port Evaluation on Ship Traffic Rate Performance

Terminals	BUA		PTOL	
Year	Vessels	GRT	Vessels	GRT
2018	71	1,155,840	134	1,910,759

2019	44	660,053	155	2,385,480
2020	132	1,630,115	173	1,920,475
2021	62	1,006,801	152	2,399,573
2022	48	591,152	155	2,825,642
Total	**357**	**5,043,961**	**769**	**11,441929**

Source: *NPA Reports, Monitoring and Regulatory (2018-2022)*

The analysis of 2018 for Port Harcourt port shows that PTOL recorded a higher number of berthed ships with 134 ships and 1,910,759 GRT than BUA with 71 ships and 1,155,840 GRT.

The 2019 number of handled ships reveals that PTOL handled a total of 155 ships with a GRT level of 2,385,480 and BUA handled 44 ships with a GRT level of 660,053. It was also noted that BUA was not on operation for the third and fourth quarters of 2019 due to the decommissioning of the terminal by the federal government because of inability to meet up to development plan agreements. The 2020 analysis shows that PTOL recorded highest number of ships for Port Harcourt Port with 173 and 1,920,475 GRT against BUA 132 and GRT of 1,630,115 respectively. The 2021 assessment shows that the total ship handles by PTOL was recorded as 152 ships, 2,825,642 GRT and BUA 62 ships and a GRT of 1,006,801.

The analysis of 2022 show that 155 ships berthed by PTOL and 2,825,642 and BUA with 48 ships and 591,152 GRT.

Table 3: Onne Port Assessment on Ship Traffic Rate Performance

Terminal	**WACT**		**INTELS**		**OMT**		**BRAWAL**	
Year	Vessels	GRT	Vessels	GRT	Vessels	GRT	Vessels	GRT
2018	152	6,024,133	81	770,643			31	204,722
2019	131	5,044,018	98	910,120			61	456,846
2020	133	4,826,200	70	890,490			65	596,301
2021	115	4,578,287	78	1,292,318			51	420,345
2022	94	3,855,685	59	1,467,473	81	2,554,275	35	275,520
Total	**625**	**18,304,163**	**387**	**5,055,192**	**81**	**2,554,275**	**243**	**1,953,734**

Source: *NPA Reports, Monitoring and Regulatory (2018-2022)*

The 2018 ship traffic rate evaluation of Onne port shows that WACT recorded 152 ships and 6,024,133 GRT as the highest number of ships traffic rate for 2018. However, INTELS FLT recorded 81 ships handled and 770,634 GRT compare to ship traffic rate of Brawal 2018 with the least performance for Onne port with the rate of 31 ships and 204,722 GRT.

The analysis of 2019 shows that WACT recorded the highest number of ships traffic rate for Onne port as handled by WACT with 131 ships and 5,044,018 GRT overall performance for 2019. Intels recorded 98 ships and 910,120 GRT and Brawal recorded a second terminal operator to berth the second highest number of ships at Onne port with a total number of 31 Ships and 204,722 GRT for 2019.

The performance of 2020 Onne ship traffic rate evaluation shows that WACT berthed total of 133 ships and 4,826,200 GRT. The assessment shows 70 ships berthed by Intels and GRT of 890,490. Brawal with 65 ships registered at berth for 2020 with a GRT of 96,301 the periods under review.

The analysis of Onne port 2021 number of vessels visiting the port shows that WACT recorded a total number of 115 ships and 4,578,287 GRT as the terminal with the highest number of ships handle, seconded by INTELS with 78 ships and 1,292,318 GRT, then Brawal with 51 ships and GRT of 420,345. WACT emerges as the best Onne port performing terminal operator to handles 94 ships and a GRT of 3,855,658 for the year 2022. However, the newly commission terminal operator (OMT) recorded on their first shipping operation as a terminal operator as the second most performer for Onne port with total number of 81 ships and a ship GRT of 2,554,275; INTELS with 59 ships and 1,467,473 GRT; Brawal with 35 ships but recorded the least GRT for 2022.

Table 4: Calabar Port Evaluation of Ship Traffic Rate Performance

Terminals	**Intels**		**Ecomarine**		**Shoreline**	
Year	Vessels	GRT	Vessels	GRT	Vessels	GRT
2018	-	-	87	1,096,430	131	142,361
2019	1	3,874	75	1,102,161	81	65,490
2020	11	32,350	102	2,204,479	11	6,493
2021	-	-	85	2,126,633	33	26,791
2022	5	16,917	71	1,757,114	45	24,248
Total	**17**	**53,141**	**425**	**8,286,817**	**301**	**265,383**

Source: *NPA Reports, Monitoring and Regulatory (2018-2022)*

The evaluation of 2018 shows that Shoreline terminal operator recorded the highest number of berthed ships with 131 ships but a low GRT of 142,361 and ECMT also recorded 87 ships and 1,096,430 as the highest GRT and INTELS was unable to handle any shipping operation for 2018. The performance of 2019 showed that 81 ships were handled by Shoreline and GRT of 65,490 and 75 ships were berthed by ECMT with GRT of 1,102,161 and the least was INTELS with 1 ship and GRT of 3,874. The assessment of 2020 shows that ECMT recorded the highest number of ships with 102 ships, 2,204,479 GRT and both INTELS and Shoreline recorded 11 ships each but INTELS recorded a higher GRT of 32,350 as against Shoreline with 6,493. The assessment of 2021 shows that ECMT recorded 88 ships altogether with 2,126,633 GRT, and a record of Shoreline was 33 ships and 26,791 GRT as INTELS recorded zero. The performance records of 2022 shows, 71 ships were berthed by ECMT and 1,757,114 GRT. Shoreline recorded 45 ships and GRT of 24,248 and lastly INTELS with 16,917.

Annual Ship Traffic Rate among Eastern Nigeria Ports

Table 5: Annual Total Ships handled among Eastern Nigeria Ports

NAME OF SEAPORT	2018	2019	2020	2021	2022	TOTAL
Delta Port Complex	101	57	76	75	58	**367**
Rivers Port Complex	205	199	206	214	203	**1,027**
Onne Port Complex	264	291	268	244	269	**1,336**
Calabar Port Complex	218	157	124	118	120	**737**
TOTAL	**788**	**704**	**674**	**651**	**650**	**3467**

Source: *NPA Reports, Various Issues (2018 – 2022)*

Table 6: Annual Ship Gross Registered Tonnage (GRT) Rate handled among Eastern Nigeria Ports

NAME OF SEAPORT	2018	2019	2020	2021	2022	TOTAL
Delta Port Complex	993,927	727,143	1,029,180	1,944,200	883,551	**5,578,001**
Rivers Port Complex	2,199,719	2,715,507	2,328,004	2,651,273	2,973,430	**12,867,933**
Onne Port Complex	6,999,498	6,410,984	6,312,991	6,290,950	8,152,926	**34,167,349**
Calabar Port Complex	1,238,791	1,171,525	2,243,322	2,153,424	1,787,001	**8,594,063**
TOTAL	**11,431,935**	**11,025,159**	**11,913,497**	**13,039,847**	**13,796,908**	**61,207,346**

Source: *NPA Reports, Various Issues (2018 – 2022)*

Table 7: Annual Ship Handled Percentage (%) among Nigeria Eastern Ports from 2018-2022

NAME OF SEAPORT	2018	2019	2020	2021	2022	Total Ships (%)
Delta Port Complex	12.8	8.2	11.3	11.5	8.9	**10.6**
Rivers Port Complex	26	28.2	30.5	32.9	31.2	**29.6**
Onne Port Complex	33.5	41.3	39.8	37.5	41.4	**38.5**
Calabar Port Complex	27.7	22.3	18.4	18.1	18.5	**21.3**
Total Percentage	**100**	**100**	**100**	**100**	**100**	**100**

Source: *NPA Reports, Over Time (2018 – 2022)*

Table 8: Annual Gross Register Tonnage Percentage (%) among Nigeria Eastern Ports from 2018-2022

NAME OF SEAPORT	2018	2019	2020	2021	2022	Total GRT (%)
Delta Port Complex	8.7	6.6	8.6	15	6.4	**9.1**
Rivers Port Complex	19.3	24.6	19.6	20.3	21.6	**21**
Onne Port Complex	61.2	58.2	53	48.2	59	**55.8**
Calabar Port Complex	10.8	10.6	18.8	16.5	13	**14.1**
Total Percentage	**100**	**100**	**100**	**100**	**100**	**100**

Source: *NPA Reports, Over Time (2018 – 2022)*

Evaluation of the differences in ship traffic rate component among the Nigeria Eastern ports over time; data on ship traffic rate and number of ships completed from the four Eastern ports between 2018 and 2022 were sourced from the publications of Nigerian Port Authority (NPA) and used for the evaluation. Table 5 to table 8 shows the evaluation of ship traffic rate component among Eastern Nigeria seaports from 20118 to 2022. The evaluation shows Delta Port recorded on 2018 handled 101 (12.8%) ships and GRT of 993,927 (8.7%); 57 ships (8.1%) and 727,143 GRT (6.6%) for 2019; 76 ships (11.3%) and 1,029,180 GRT (8.6%) for 2020; 75 ships (11.5%) and 1,944,200 GRT (15%) for 2021 as well as 58 ships (8.9%) and 883,551 GRT (6.4%) for 2022. Port Harcourt port recorded 205 ships (26%) and 2,199,719 GRT (19.3%) for 2018; 199 ships (28.2%) and 2,715,507 GRT (24.6%) for 2019; 206 ships (30.5%) and 2,328,004 GRT (19.6%) for 2020; 244 ships (32.9%) and 2,651,273 GRT (20.3%) for 2021 as well as 203 ships (31.2%) and 2,797,929 GRT (21.5%) for 2022.

Onne port evaluation performances shows 264 ships (33.5%) and 6,999,498 GRT (61.2%) for 2018; 291 ships (41.3%) and 6,410,984 GRT (58.2%) for 2019; 268 ships (39.8%) and 6,312,991 GRT (52.9%) for 2020; 244 ships (37.5%) and 6,290,950 GRT (48.2%) for 2021 as well as 269 ships (41.4%) and 8,152,926 GRT (59.1%) for 2022. Calabar port record shows 218 ships (24.7%) and 1,238,791 GRT (10.8%) for 2018; recorded 157 ships (22.3%) and 1,171,525 GRT (10.6%) for 2019; 124 ships (18.4%) and 2,243,322 GRT (18.8%) for 2020; 118 ships (18.4%) and 2,153,424 GRT (16.5%) for 2021 as well as 120 ships (21.3%) and 1,787,001 GRT (13%) for 2022.

Table 9: Descriptive Statistics for Ship Traffic Rate among Nigeria Eastern Ports

Total Ship Traffic Rate	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Delta	5	1115600.2000	477911.15141	213728.36435	522195.1290	1709005.2710	727143.00	1944200.00
Rivers	5	2573586.6000	310700.46546	138949.47228	2187801.0178	2959372.1822	2199719.00	2973430.00
Onne	5	6833469.8000	792503.97361	354418.55149	5849446.1475	7817493.4525	6290950.00	8152926.00
Calabar	5	1718812.6000	499647.69868	223449.24381	1098418.0408	2339207.1592	1171525.00	2243322.00
Total	20	3060367.3000	2351777.68075	525873.47621	1959701.4647	4161033.1353	727143.00	8152926.00

Source: *NPA Reports, Various Issues (2018 – 2022)*

The result of the descriptive analysis presented on Table 7 for the stated hypothesis four showed that the independent variable, port location had four groups: Delta Port Complex (M= 1115600.20, SD = 477911.151, n = 5), Rivers Port Complex (M = 2573586.60, SD = 310700.465, n = 5), Onne

Port Complex (M = 6833469.80, SD = 792503.974, n = 5) and Calabar Port Complex (M = 1718812.60, SD = 499647.699, n = 5).

Analysis of Variance (ANOVA) on Ship Traffic Rate Performance

Objective: To evaluate the differences in ship traffic rate among Nigeria Eastern Ports.

Hypothesis:

H_0: There is no statistically significant difference ship traffic rate among Nigeria Eastern Ports.

H_1: HO: There is a statistically significant difference ship traffic rate among Nigeria Eastern Port

Table 10: Analysis of Variance (ANOVA) Test

Total Ship Traffic Rate	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	100275730058666.190	3	33425243352888.730	111.173	.000
Within Groups	4810576875466.000	16	300661054716.625		
Total	105086306934132.190	19			

Source: *NPA Reports, Various Issues (2018 – 2022)*

Table 8 showed that the Analysis of variance was significant, F (3, 16) = 111.173, p = 0.000, n^2 = .000. Since the computed F is greater than the critical value, there is a significant evidence to accept the alternate hypothesis and conclude that there exists a statistical significant difference in the performance of ship traffic rate among Nigeria Eastern seaports. According to Cohen's (1988) conventions for interpreting effect size, the actual difference in the mean scores between groups was quite big based on.

Since the ANOVA test show significant difference, posthoc analysis was used in determining the differences among the Eastern ports, using Tukey HSD

Table 11: Post Hoc Tests for Ship Traffic Rate

Multiple Comparisons

Dependent Variable		(I) Name of Port	(J) Name of Port	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Total Ship Traffic Rate	Tukey HSD	Delta Port Complex	Rivers PC	-1457986.40000*	346791.61162	.003	-2450164.0814	-465808.7186
			Onne PC	-5717869.60000*	346791.61162	.000	-6710047.2814	-4725691.9186
			Calabar PC	-603212.40000	346791.61162	.337	-1595390.0814	388965.2814
		Rivers Port Complex	Delta PC	1457986.40000*	346791.61162	.003	465808.7186	2450164.0814
			Onne PC	-4259883.20000*	346791.61162	.000	-5252060.8814	-3267705.5186
			Calabar PC	854774.00000	346791.61162	.104	-137403.6814	1846951.6814
		Onne Port Complex	Delta PC	5717869.60000*	346791.61162	.000	4725691.9186	6710047.2814
			Rivers PC	4259883.20000*	346791.61162	.000	3267705.5186	5252060.8814
			Calabar PC	5114657.20000*	346791.61162	.000	4122479.5186	6106834.8814
		Calabar Port Complex	Delta PC	603212.40000	346791.61162	.337	-388965.2814	1595390.0814
			Rivers PC	-854774.00000	346791.61162	.104	-1846951.6814	137403.6814
			Onne PC	-5114657.20000*	346791.61162	.000	-6106834.8814	-4122479.5186
	LSD	Delta Port Complex	Rivers PC	-1457986.40000*	346791.61162	.001	-2193151.7752	-722821.0248
			Onne PC	-5717869.60000*	346791.61162	.000	-6453034.9752	-4982704.2248
			Calabar PC	-603212.40000	346791.61162	.101	-1338377.7752	131952.9752
		Rivers Port Complex	Delta PC	1457986.40000*	346791.61162	.001	722821.0248	2193151.7752
			Onne PC	-4259883.20000*	346791.61162	.000	-4995048.5752	-3524717.8248
			Calabar PC	854774.00000*	346791.61162	.025	119608.6248	1589939.3752
		Onne Port Complex	Delta PC	5717869.60000*	346791.61162	.000	4982704.2248	6453034.9752
			Rivers PC	4259883.20000*	346791.61162	.000	3524717.8248	4995048.5752
			Calabar PC	5114657.20000*	346791.61162	.000	4379491.8248	5849822.5752
		Calabar Port Complex	Delta PC	603212.40000	346791.61162	.101	-131952.9752	1338377.7752
			Rivers PC	-854774.00000*	346791.61162	.025	-1589939.3752	-119608.6248
			Onne PC	-5114657.20000*	346791.61162	.000	-5849822.5752	-4379491.8248

*. The mean difference is significant at the 0.05 level.

The multiple comparisons using Tukey's HSD of ship traffic rate performance among the Nigeria Eastern ports. Each row compares ship traffic rate with performances in one port to others in four ports. In other word, the Post Hoc comparisons help in evaluating the grouping differences among the ports means were conducted using the Turkey HSD and LSD test since equal variances were tenable. The posthoc tests shows the significant group differences between the mean scores of ship traffic rate of Delta port complex and Rivers port complex; Delta port complex and Onne port complex, $p < 0.05$; The mean scores of ship traffic rate of Delta port complex do not significantly differ from that of Calabar port complex, $p > 0.05$.The mean scores of ship traffic rate also revealed significant pair wise differences between the mean scores of ship traffic rate of Rivers port complex and Onne port complex; and Onne port complex and Calabar port complex, $p < 0.05$. The mean scores of ship traffic rate of Calabar port complex do not significantly differ from the other two groups that comprise Delta port complex and Rivers port complex, $p > 0.05$.

Discussion of Findings

The result of the findings revealed that the ship traffic rate performance of Onne port was higher than other ports among the Nigerian Eastern ports with 264 ships and 6,999,498 GRT for 2018; 291 ships and 6,410,984 GRT for 2019; 268 ships and 6,312,991 GRT for 2020; 244 ships and 6,290,950 GRT for 2021 as well as 269 ships and 8,152,926 GRT for 2022. Port Harcourt port according to the findings recorded 205 ships and 2,199,719 GRT for 2018; 199 ships and 2,715,507 GRT for 2019; 206 ships and 2,328,004 GRT for 2020; 244 ships and 2,651,273 GRT for 2021 as well as 203 ships and 2,797,929 GRT for 2022 to emerge as second in ranking among the Nigerian Eastern Ports.

The findings revealed that PTOL was the most performed in umber of ships handled from 2018 to 2022 with 769 ships berthed at Port Harcourt port, followed as second was WACT with 625 berthed ships berthed at Onne port, followed as third was Calabar port Ecomarine terminal operator with 425 ships; INTELS Onne was ranked fourth with 387 ships at berth; Port Harcourt Port BUA terminal operators emerges as the fifth most performed operators in ship handling numbers with 357 ships; Calabar Shoreline terminal operator performance was ranked sixth having berthed 301 ships; Onne port Brawal terminal operator ranked seventh with 243 ships at berthed and Delta port most performed terminal operator (Julius Berger) was ranked eight among the terminal operators of Nigeria Eastern port in number of ships handled with 226 ships and Associated Maritime was next with 102 berth ships; OMT Onne performance shows that the overall performance of Onne port in the nearest future will improve, having recorded 81 berthed ships on their first year of operation as terminal operator for 2022, to ranked third on the 2022 performance assessment behind PTOL and WACT terminal operators. However, intels Delta port and Calabar port recorded very low performances with berthing of 50 ships for Delta port Intels and 17 ships for Calabar port Intels, as the least performed port for the period under review was Ocean and Cargo with 1 ship berthed in 2022.

The gross registered tonnages of ships performance evaluation for the ships berthed at the Nigeria Eastern ports terminals shows that WACT berthed the biggest sizes of ships among other terminal operators with 18,304,163 GRT and PTOL with 11,441,929 to ranked second in sizes of ship berthed, Calabar Ecomarine recorded 8,286,817 GRT to ranked third and Intels Onne berthed GRT of 5,055,192 to performed slightly better than BUA with 5,043,961 GRT; Shoreline Calabar also berthed 265,383 GRT; OMT on their first year operation (2022) berthed a GRT of 2,554,275 and

Delta Port AMS and JBN recorded 2,487,552 and 2,073,588 GRT respectively as the most performed operator at the port as Onne Brawal recorded 1,953,734 GRT; Delta Intels recorded 1,038,574 GRT and Calabar intels recorded 53,141 GRT and Ocean and Cargo with 4,150 GRT as the most under performed.

However, the findings revealed that the evaluation of ports performance among the Nigeria Eastern ports shows that Onne performance was the highest with 1,336 ships and GRT of 34,167,349 followed by Port Harcourt port with 1,027 ships and 12,867,933 GRT. Calabar port was third with 737 ships, 61,207,346 GRT and Delta was the least performance with 376 ships and GRT of 5,578,001 GRT. The study revealed that number of ships handled at Calabar, Onne port BRAWAL as well as Delta ports with low ship traffic rate are related to low channel draft as well as low berth depth that impede berthing of bigger ships.

The finding of the study on assessment of ship traffic rate performance among the Nigeria Eastern ports revealed that the Analysis of variance was significant, with DF (3, 16), F= 111.173, p = 0.000, n^2 = .000. Thus, there exists a statistical significant difference in the ship traffic rate among Nigeria Eastern seaports. According to Cohen's (1988) conventions for interpreting effect size, the actual difference in the mean scores between groups was quite big based on.

Conclusions

The study evaluated ship traffic rate performance of Nigerian Eastern ports from 2018 and 2022. The research study focused on the NPA concession areas as the scope of the study to analyze the difference that exists between ship traffic rate performances of Nigerian Eastern Ports. Ship traffic rate assessment shows that Onne, Port Harcourt, Calabar and Delta ports were ranked accordingly to their performances, as the study shows that there is a statistical significant difference in the ship traffic rate among Nigeria Eastern seaports.

Generally, the level of ship handled by sampled by Nigeria Eastern ports varied between 2018 and 2022. It was observed that all the ports experienced staggering growth overtime as this were blamed to several factors ranging from poor policy implementation by government, insecurity (ranging from militancy, terrorism and sea pirates) to poor facilities around ports such as the low draft of berth and shallow channels, that would have increased ship traffic rates, caused the ships to be redirected to another ports with better performance indicators.

Recommendations

- Based on the finding as revealed by the study, Calabar and Delta ports channels should be dredge by the Ports Authority to accommodate larger ships so as to increase both the ship rate and the cargo throughputs performance.
- Government should ensure that the channels are properly secured by the coast guards, so as to ensure no extra cost of hiring armed security guards for protection of ship, cargoes and crews onboard.
- Eastern Nigerian Ports should adopt the use of modern scanners to avoid delays in handling of ships and cargoes.
- Terminal operators should ensure that functional and modern cargo handling equipment are available to improve turnaround time of ships at berth

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ASSESSMENT OF GOVERNMENT RESPONSE TOWARDS COMBATING THE FARMERS-HERDERS CRISES IN DELTA STATE.

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Abstract

This study examines the effectiveness and shortcomings of strategies implemented to mitigate farmers-herders' conflicts in Delta State, Nigeria. Despite numerous initiatives by the government and community leaders, the persistent violence has posed challenges to peace and stability in the region. Through qualitative research, this paper investigates the measures taken by the state government and explores why some of these efforts have failed. Drawing on interviews with 30 stakeholders, including farmers, herders, traditional leaders, and government officials, the study identifies key initiatives such as government committees, town-hall meetings, buffer zones, police presence, and victim support. While these measures aimed to foster coexistence, their effectiveness varied, and failures emerged due to several factors. The findings reveal inadequate in financial support, accusations of partiality by security agents and leaders, corruption, rapid development, language barriers, and a lack of trust among stakeholders. Insufficient funding hindered proactive actions, while perceptions of bias among security agents and leaders fueled distrust and exacerbated tensions. Corruption further undermined the implementation of initiatives, while rapid development reduced available land, escalating conflicts. The study underscores the need for comprehensive evaluations of intervention strategies to identify gaps and improve future approaches. It highlights the importance of addressing financial constraints, impartiality in law enforcement, corruption, and fostering stake-holder trust. By understanding these challenges, policymakers can develop more effective and inclusive measures to resolve farmers-herders conflicts and promote peace in Delta State and beyond.

1.0 Introduction

In 2018, Benjamin Cheque, an Isoko North local government official, was killed on his farm with the event also claiming the lives of over 23 other people in the area; in 2019, 45 people were killed in Ossissa community in Ndokwa West Local Government Area (Sahara Reporter, 2020). These attacks were attributed to the conflict between farmers and herders. The issue of farmers and herders crisis is an age-long problem that not only affects Delta State but every state in Nigeria. Amnesty International in their 2020 report, documented 1531 fatalities attributed to the dispute between farmers and herders in Nigeria (Amnesty International, 2021).

The causes of these crises have been extensively documented in scholarship. These includes but not limited to water scarcity, desertification, uncontrolled population growth, rising unemployment rates, porous national borders, incursion on grazing pathways and reservations, nomadic lifestyles (Idowu, 2018), lack of knowledge about grazing routes and laws, soil compartmentalisation and loss of fertility, crop damage caused by cattle (Mercy Corps, 2015), indiscriminate bush burning, dissemination of fake news and media propaganda, politicization (Atobatele & Moliki, 2022), rural banditry and cattle theft, insecurity in the Sahel region, the proliferation of small arms, retaliatory actions, inadequate government responses, and the spread of fear and hate speech (International Crisis Group, 2018). Over the years, the government (federal, states, and local) has undertaken several studies, implemented their recommendation, and enacted several laws geared towards ending the farmers-herders crisis in the country (Idowu, 2018). Some of which include RUGA, grazing law, and presidential initiatives among several other (Alli, 2021).

In Delta State, the state government has implemented various measures to address the farmers-herders crisis, including policy interventions, conflict resolution mechanisms, and security measures with little or no success (Abugu et al., 2022). Therefore, a critical assessment of the effectiveness, limitations, and potential reasons for the failure of these strategies is essential; however, this assessment is lacking in the literature. Without a thorough evaluation of these measures, their limitations, and reasons for potential failures, it is challenging to identify gaps and propose improved interventions. Identifying the gaps and constraints within these initiatives is crucial to understand why they may have fallen short of their intended outcomes.

This paper assesses the effectiveness and failure of all measures taken towards combating the farmers-herders crises in Delta State, Nigeria using the following research questions:

1. What are the measures that were taken by the state government in combating farmers-herders crises in the Delta state and how efficacious have they been?

2. Why have some of the measures taken towards addressing the farmers-herders' crises failed in Delta state?

2.0 Methodology

The study used a qualitative research design. The research was conducted within Delta State; however, only two of the three senatorial zones of Delta State (Delta North and Delta Central) were covered in this study as the communities that met the inclusive and exclusive criteria are all located within these two zones. Furthermore, the study was limited to a period of 7 years (2015-2021), hence only communities that had experienced persistent herders-farmers crises within this period were included in the study.

Figure1: Map of Delta State

Inclusion Criteria

The inclusion criteria for the selection of sample community include the following;

i. The community must have farmers and herders' settlements.
ii. The community must have experienced farmers-herders clashes at least once in a year.
iii. The community must have experienced farmers-herders clashes repeatedly in the last five years.

Data collection method

Data for the study was collected through one-on-one interviews. These interviews were conducted using an interview guide developed by the researchers. The interview guide contained five open-ended questions aimed at determining the various peace-building approaches being used by the Delta state government in addressing the issue of the farmers-herders crisis in Delta state as well as determining why these approaches have failed in the state.

A total of 30 participants were purposively selected and interviewed for the study. In each of the communities that met the inclusive criteria, the interviewed participants were purposively selected based on the leadership position they held in their respective stakeholder group. This comprised farmers, herders, traditional, and community leaders. Furthermore, officials from the Delta State Ministry of Agriculture and Delta State Livestock Management Committee included in the interview group were selected based on their roles as officials involved in government efforts in addressing the farmer-herder crisis in the state. This consisted of one staff of Delta State Ministry of Agriculture and two members of Delta State Livestock Management Committee. The breakdown of the interview participants according to their communities and stakeholder groups is presented in Table 1.

Table 1: Breakdown of group distribution

S/N	Community	Herder	Farmer	Traditional/community leader	Total
1	Emuhu community	1	1	1	3
2	Okapanam community	1	1	1	3
3	Umuachi-Afor community	1	1	1	3
4	Obulu-Uku community	1	1	1	3

5	Uwheru community	1	1	1	3
6	Avwon community	1	1	1	3
7	Unenurhie community	1	1	1	3
8	Agadama community	1	1	1	3
9	Ohoror community	1	1	1	3
10	Government Officials				3
					30

Each participant was interviewed, one-on-one, by the researchers and two research assistants with the aid of the interview guide. All the interviews conducted were recorded using an electronic device (phone), this was done in order for record purposes as well as for eventual transcription. The interviews were conducted between January 2022 to March 2023, a period of 15 months. The inductive approach to thematic analysis was used to analyse the data acquired from various interviews.

3.0 Result

3.1 Measures that have been taken by the state government in combating farmers-herders crises in the Delta State and their effectiveness

Setting up of government committee whose aim is to address the issue of farmers-herders crises in the state

The Delta state government through the Ministry of Agriculture and Natural Resources sets up a committee whose main goal is to tackle the problem of farmers-herders' crises in the state. Headed by the Commissioner for Agriculture and Natural Resources, Dr Godfrey Enita, the committee has been holding meetings with the various stakeholders in the crises.

Regular Town-hall Meetings

As stated by a member of the Delta State Livestock Management Committee (DSLMC), the authority usually hosts regular town hall meetings with major stakeholders in the various communities. At these meetings, innovative ideas and suggestions aimed at tackling the major factors that cause the farmers-herders crises and bring about lasting peace in the various communities. Furthermore, the stakeholders are enlightened about the various measures the government is putting in place in to forestall any future crises and guarantee peaceful coexistence between farmers and herders in the state.

The senior staff of the Ministry of Agriculture stated that *"We regularly conduct regular town-hall meetings at communities that have experience farmers-herders' crises. At these meetings, all the major stakeholders in the communities are gathered together and the various efforts of the government concerning the crises are explained to them. Furthermore, the meetings are used as an avenue to identify lasting solutions aimed at achieving lasting peace in the communities"*

From the communities' stakeholders' point of view; the government sometimes visit the communities to conduct town-hall meetings where they sample the opinions of different stakeholders on the various things that can be done to address the issue of farmers-herders' crises as well as update them on the various measures put in place by the government in order to forestall further crises in the communities. As put by a traditional leader in Uwheru community in Ughelli North Local government area *"Some government officials usually visit us every time there is a farmer-herder crisis in the community. They will visit and organize meeting where they will gather farmers, herders, community leaders, traditional leaders, and community inhabitants to talk about the importance of peace and why they should all strive to keep peace in the community. They will talk to the leaders of each group to organize their respective groups and make sure they keep peace in the community. However, most of the time they only talk without putting in action that will help address the root cause of the crises. It seems they (the government officials) just want to show up at the community so that they can make a report to their superiors that they visited the community. Also, I think they just want to pretend to the community that they are doing something."*

Establishment of buffer zones between farmland and herders' settlements in communities where there are local herders

Another measure that has been put in place by the Delta State government is the creation of buffer zones (an area that creates a clear boundary between the herders and the farmers in the communities). With the help of the community and traditional leaders, the government was able to create a designated area where the herders can comfortably graze their cattle in each community and also creates a buffer zone between the framers and the herders. This was done to limit contact between the farmers and the herders as well as give the herders a sense of belonging in the community.

As the senior staff stated: *"We discovered through our numerous town hall meetings and dialogues with the stakeholders that frequent contact between the farmers and herders, when each of them are performing their respective activities, is a major cause of the crises. Therefore, we decided that the best way to prevent crisis is to limit the contact to the barest minimum. We therefore liaison with community and traditional leaders of the communities where there are herders' settlements to allocate areas where the herders can comfortably graze their cattle without getting in contact with the farmers' farmlands. Also, we create a buffer zone (a limit) where farming or grazing activities cannot take place; allowing for a clear demarcation between the farmlands and the graze lands."*

The community stakeholders also attest to the fact that the government has helped create a buffer zone between farmland and graze lands in the communities. According to a traditional leader in Uwheru community in Ughelli North Local government area: *"The government through the local government chairman has found a way to convince the local communities to donate their land so that they can create an area where only cattle grazing can be done. Although most of the communities feel they are being deprived of their ancestral land; they have no choice but to give the government the land. Also, part of the donated land was used as a form of demarcation between the community farmland and the designated graze land; in this area, no farming or grazing activity is permitted. This measure has helped in limiting contact between the farmers and the herders."*

Regular orientation of the farmers and herders on the importance and benefits of peace and cohabitation

Apart from the town hall meetings organized by the Delta State Livestock Management Committee (DSLMC) in the communities, workers from the Ministry of Agriculture and Natural

Resources (the parent ministry of the Committee) regularly visit the communities to talk to the herders and farmers separately. The ministry workers visit the herders in their communities to talk to them about the importance and benefits of peaceful cohabitation with the farmers. The same visitations are also done at the farmers' settlements.

As illustrated by a member of Delta State Livestock Management Committee (DSLMC) who had joined the ministry workers in such a meeting: *"The meeting is an initiative of the Ministry of Agriculture and is usually spearheaded by the ministry staff. I was part of a delegation that went to visit a herder's settlement in Okpanam community in 2020 after a crisis. In the meeting, we talked to the leaders of the herder settlement on the issue of tolerance and peaceful cohabitation with the farmers in the communities. Also, the delegation informed the leaders on the importance of reporting grievances and infraction to the constituted authorities (community leaders, police, and state and local government officials) rather than take laws into their hands."*

The above meeting was also collaborated by some of the herders in Okapanam community; a narrative from one of the leaders of the community is transcribed as follows: *"After the clashes that happened in June 2020; some government officials came to our settlement to talk to us. They talked about how we have to live in harmony with the farmers and other community inhabitants. They also told us not to put laws into our hands and always report all grievances and infractions to the constituted authorities."*

Establishment of police posts/stations at communities that experience frequent farmers-herders crises

Delta state government has facilitated the establishment of police stations/posts in communities that are flash points of the farmers-herders crises. This initiative has brought law enforcement agents near the communities thereby giving the communities an avenue to relay their complaints to the authority. Also, this measure has helped to initiate early interventions whenever there is a crisis in the communities by the quick deployment of police personnel to the affected communities.

As stated by a community leader in Emuhu, Ika Local Government Area: *"Before the 2017 crisis in our community, our community had no police presence. However, after the crisis; a police post* *was built in the community thereby bringing law enforcement agents close to the community. Now due to the police presence; there have been lesser clashes between the farmers and herders in the community."* Another traditional leader from Unenurhie community in Ughelli North Lga has this to say: *"Our community has suffered from incessant attacks by herders causing lots of damages to our farmland, destruction of our properties and many deaths. Several efforts have been made by the community leaders to bring police presence to the community with no success. However, after the attack of February 2018; a police post was brought to our community. The authorities said this will allow for quick intervention of law enforcement agents whenever there is a crisis in the community."*

Provision of support for victims of the crises

The state government have provided support to all the categories (children, women, aged, herders, and farmers) of the victims of the various crises in the state. The state government has also established rehabilitation centres in the state to cater to victims of farmers-herders crises.

According to some community and traditional leaders in Avwon, Uwheru, Agadama, Ohoror in Ughelli Local Government Area: *"Whenever there is a crisis in the community, just like the one that happened in February 2020 that caused the destruction of buildings and farmland, government officials usually come with foods and some basic materials needed for survival as most people were displaced and had nowhere to go. Although these things were not always enough, it somehow brings immediate relief to the victims of these crises."* This opinion was also collaborated by community leaders from Udo, Obulu-Uku, Inyi, and Umuachi-Afor communities during the interviews: *"We sometimes get little assistance from the state government whenever there is a crisis in the community. The assistance comes in form of foods and blankets."*

The reason the various measures taken towards addressing the farmers-herders crises and peace-building process failed in Delta State

Inadequate financial commitment on the part of the state government

Although the government has made several attempts to build required peace between the herders and farmers in the state through different initiatives and measures; the government has failed to support these initiatives and measures with the require funding. Lack of funding has hindered the activity of the Delta State Livestock Management Committee (DSLMC) to the point that the committee only takes reactive action instead of proactive actions.

According to the member of the committee; *"The committee was formed to develop a blueprint for achieving lasting peace between the farmers and herders in the state. However, it has been reduced to sympathy visiting committee that only visit the communities after there has been a crisis due to lack of funding. The only thing the committee does is visit the communities after every incident. After that, everyone goes back to their respective jobs waiting for the next crisis."* The problem of inadequate funding was also echoed by a senior staff at the Ministry of Agriculture and Natural Resources; *"The ministry has a lot of initiative and measures that can help to actualize peaceful coexistence between the farmers and herders. However due to lack of funds; these measures and initiatives have not been put to practice. A typical example is the sensitization efforts usually performed by the ministry staff on a regular basis. These sensitization meetings have been found to be effective in fostering peaceful interactions between the two major stakeholders (sic: herders and farmers), unfortunately these meetings are not being held regularly anymore due to financial constraints."*

The accusation of partiality by security agents, community and traditional leaders, and government officials

Another major hindrance that was identified is the accusation of partiality by security agents, traditional and community leaders and government officials. These accusations came from both the herders and the farmers. The herders complained that the community and traditional leaders as well as the government officials always support the farmers whenever there is a dispute between them and the farmers. They also said that their grievances are not always addressed properly by the local authorities whenever they visit to complain. Furthermore, they stated that the police do not protect them whenever they are attacked by the farmers during disagreements and alterations.

A leader in the herders' community stated: *"The police, government officials, and community and traditional leaders always support the farmers whenever there is a disagreement between us. They turn a blind eye whenever the farmers kill our cattle or attack us, but if a herder does some time, they will start shouting that we are the ones causing trouble."*

Another herder's leader in another community also collaborated with the statement: *"There was a time some farmers killed one of our cattle and we went to complain to the community leader. Even though we were able to identify the person responsible; the community leaders end up turning everything against the herder making it impossible for us to get justice for the atrocity. However, when some of our cattle wandered into some farmland and destroyed some crops; we were made to pay for the damaged crop, even inflating the price of the crops"*

In the various interviews conducted in a herder settlement in Ughelli Local Government Area; the herders complained that the police are also partial when treating disputes between them and the farmers. They stated that the police always protect the farmers and community inhabitants during clashes and help in attacking the herder's settlement. The allegation of partiality of government officials and the police was also brought forward by the farmers during the interviews. In contrast with the herders; the farmers pointed their accusing fingers towards the police and government officials. They complained that the police always supported the herders during the crises. Some of them even accuse the police of giving firearms to the herders.

According to a farmer in Umuachi-Afor community: *"The police are the main enablers of the herders. They see them moving around with guns and dangerous weapons and pretend as if they did not see them. Whenever we complain to the police about the herders' destruction of our crops and farmland; they will not do anything. And when we organize ourselves and chase the herders and cattle out of our farmland, they (the police) will come to the community and arrest our youths."* Another farmer in Unenurhie community in Ughelli North Lga in an interview stated that: *"Because most of the military men in this area are from the Northern region of the country and speaks the same language with the herders; the herders use them to threaten the farmers whenever there is a disagreement between the farmers and the herders"*

The accusation of partiality has resulted to lack of trust in the authorities both by the farmers and the herders causing them to resort to violence whenever there is a disagreement between them. This is because they believe they cannot get justice from the authorities.

Corruption

Just like in every aspect of the country, corruption was also identified as a major factor that has limited the effectiveness of the measures put in place by the Delta State Government to address the issue of farmers-herders crises in the state. The farmers and herders accused their respective leaders of corruption, the leaders said the government officials were corrupt, and the government officials accused the law enforcement agencies of corruption.

According to a farmer in Unenurhie community in Ughelli North Lga: *"Our community and traditional leaders are very corrupt; they collect money from the herders and allocate our farmland to them for the grazing of their cattle when they know we don't have enough land to farm."* Another farmer in Umuachi-Afor community also buttress the statement; in his word: *"Our community and traditional leaders know that we don't have abundance of arable farmland; yet they will collect money from the herders and allowed them to be grazing their cattle on it. And when we complain; they will say we should endure. They collect money from the herders and look the other way when the crisis starts."*

Rapid development and industrialization

Another major factor that has negated the various measures being embarked upon by the state government is the rapid development and industrialization that most communities are experiencing in Delta State. As the population increases and people build houses for shelter; the volume of land available for cultivation and grazing reduces drastically. This has led to more frequent encounter between the herder, who before now have been living in the bush, and the farmers (who now need to move farther than before in search of land for cultivation). This has reduced the area designated for the buffer zone and increased the chance of the herders and farmers encountering each other more frequently. And as the chance of encountering each other increases, the chance of disagreement and clashes also increases. This has led to frequent clashes between these two sections leading to frequent crises.

According to a farmer in Okapanam community: *"As development comes into the community, our farmlands are being sold to people who developed it for residential building forcing us to go further into the bush to look for land for cultivation. These lands were before now occupied by the Fulani herders who had used them for grazing their cattle. Since we now cultivate these lands, the herders have refused to leave the land for us claiming they were there before us. And if we told them the land belongs to us, they will chase us we dagger and guns and allow their cows to* *destroy our crops."* Another farmer from another community also lends his voice to the discussion: *"This is our land as our ancestor cultivated the land, the Fulani herders are strangers that were given the land temporarily. Therefore, we don't need permission to claim out land from them when we need it for cultivation. They should go back to the North, we want our land back now that development has gotten to where we were farming before."*

On the part of the herders; they complained that the farmers are now encroaching into lands where they have been grazing their cattle for years. According to a herder: *"The people have sold all their farms to individuals who are building houses and are now coming into lands that their cattle graze on. They will sell their farms and ask us to move further into the bush, we will move and after sometimes they will come again asking us to move again. When we don't move, they will start planting on the land when they know that the place is where we graze our cattle."*

The negative impact of development and industrialization on the various measures embarked upon by the Delta State Government was also explained by the interviewed staff of the Ministry of Agriculture and Natural Resources. According to the ministry staff: *"Rapid development being experienced by most communities in Delta State has reduced the volume of land available for cattle grazing and farming. Most time when we create a buffer zone within a community, we realize that after sometime the buffer zone disappear as the farmers move further into the bush due to development spreading to their farm land. We also noticed that the herders are also moving outward towards the community in search of fresh vegetation thereby encroaching into farmlands. A common denomination that has been noticed is different forms of land use."*

Communication/Language barrier

Language is a fundamental tool in communication, and communication is essential in dialogue. The inability of the two major stakeholders (farmers and herders) to communicate effectively due to the language barrier was also found to be among the factors that has caused the failure of some of the measures put in place by Delta State government in tackling the farmers-herders crises in the state. Since most of the herders are illiterates and only speak Fulfude, communicating with the farmers and community leaders was an issue. Several times issues that can be resolved amicably through effective communication spiral out of hand due to language barrier.

According to a farmer in Okapanam community: *"Most of the herders do not understand simple English and are also aggressive, when we meet them in the farm with their cattle destroying our farmland; talking to them to move their cattle becomes an issue as they do not understand English."* A farmer from Ohoror in Ughelli Local Government Area said: *"Although some of their leaders can speak a bit of English; most of the herders that move the cattle around do not understand English Language. This makes it difficult for dialogues that can diffuse tensions, which sometimes leads to crisis, to happen."* The member of the Delta State Livestock Management Committee (DSLMC) also attested to the negative impact of language barrier to the implementation of the various measures: *"Several crises have been traced to lack of communication between the herders and farmers. Trivial issues that can be resolved amicably have resulted to crisis. Most of the herders do not speak nor understand English language making communicating with them difficult."*

Lack of trust among the various stakeholders

Lack of trust among the various stakeholders was also identified as a factor that negates the measures of peace building embarked upon by the state government. The farmers do not trust the herders and vice versa. This can be seen in the interviews; according to a farmer: *'These Fulani people are not to be trusted; they have ulterior motive. If they tell you they will be peaceful, it's a lie. They are violent and are killers. You trust them at your own peril."* The herders also express their distrust of the farmers and the community leader. According to a herder: *"The villagers are not trust worthy, they don't like us and want us all died. They poison our cows and deny doing it. Also, they rob us on the road and steal our money and when we complain they will deny everything. Also, the police are with them, they help them to attack us since we don't understand their language."*

Conclusion

The study has provided valuable insights into the complex and longstanding farmers-herders' crises in Delta State, Nigeria. The multifaceted nature of the challenges faced by the government and communities in addressing these crises requires a comprehensive and sustainable approach. The conclusion drawn from the findings underscores the need for urgent and strategic interventions to achieve lasting peace. This includes but is not limited to: increased funding, transparency and accountability, community-based conflict resolution, conflict sensitive policing, education and communication.

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INFORMED PEACE-BUILDING APPROACHES TOWARDS ERADICATION FARMERS-HERDER'S CRISES IN DELTA STATE

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Abstract

The conflict between farmers and herders in Nigeria, particularly in Delta State, has resulted in significant loss of life and livelihoods, posing a complex challenge with widespread repercussions. Drawing on qualitative research and existing literature, this study investigates strategies for addressing the farmers-herders crisis within Delta State from 2015 to 2021. Through one-on-one interviews with 30 purposively selected participants, including farmers, herders, traditional leaders, community leaders, and government officials, key themes and strategies were identified. Dialogue emerges as a pivotal approach for conflict resolution, with stakeholders emphasizing the importance of regular communication and local peace accords. Education and orientation initiatives for both farmers and herders are also recognized as crucial for fostering understanding and peaceful coexistence. Additionally, strategies such as ranching, security measures, and the creation of cattle routes are identified as potential interventions. While these strategies hold promise, their efficacy must be evaluated within the socio-political context of Delta State. Continued dialogue, collaboration among stakeholders, and sustained government commitment are essential for successful implementation. By fostering dialogue, promoting education, and implementing targeted interventions, Delta State can make significant strides towards resolving the farmers-herders conflict and fostering lasting peace in affected communities.

Introduction

In 2018, the unfortunate demise of Benjamin Cheque, an official from the Isoko North local government, occurred on his agricultural land, resulting in the loss of lives of more than 23 individuals within the vicinity; similarly, in 2019, 45 individuals met their demise in the Ossissa community within the Ndokwa West Local Government Area (Sahara Reporter, 2020). These violent incidents have been linked to the ongoing conflict between farmers and pastoralists. The enduring challenge of the farmers-herders conflict has had repercussions not only in Delta State but across all states in Nigeria. Amnesty International, in their 2020 publication, recorded 1531 fatalities as a consequence of the disputes between farmers and herders in Nigeria (Amnesty International, 2021).

The underlying causes of these tensions have been extensively scrutinized within academic discourse. These factors encompass, amongst others, issues such as water scarcity, desertification, unchecked population growth, escalating rates of unemployment, porous national boundaries, encroachments on grazing routes and reserves, nomadic traditions (Idowu, 2018), lack of awareness regarding grazing corridors and regulations, soil degradation and depletion of nutrients, crop destruction by cattle (Mercy Corps, 2015), indiscriminate bush burning, proliferation of false information and media manipulation, politicization (Atobatele & Moliki, 2022), rural banditry and livestock theft, instability in the Sahel region, proliferation of illicit firearms, retaliatory measures, inadequate governmental responses, and the propagation of fear and incendiary rhetoric (International Crisis Group, 2018). The governmental bodies, at the federal, state, and local levels, have over time conducted numerous inquiries and implemented the recommendations, as well as enacted various legislations aimed at resolving the farmers-herders conflict in the nation (Idowu, 2018). These efforts have included initiatives such as RUGA, grazing laws, and presidential interventions, among others (Alli, 2018).

Within Delta State, the administration has introduced diverse strategies to tackle the farmers-herders discord, encompassing policy directives, conflict mediation mechanisms, and security measures, albeit with limited success (Abugu et al., 2022). Consequently, a comprehensive evaluation of the efficacy, constraints, and potential causes for the inefficacy of these approaches becomes imperative; nevertheless, such an evaluation remains notably absent in the existing literature. Without a thorough scrutiny of these strategies, their limitations, and the reasons for potential shortcomings, it becomes arduous to pinpoint deficiencies and recommend enhanced interventions. The identification of gaps and impediments within these endeavors is pivotal to discern why they may have fallen short of achieving their desired objectives.

This paper developed an informed peace-building approaches towards eradication farmers-herder’s crises in Delta State.

Methodology

The study used the qualitative research design. The research was conducted within Delta State; however, only two of the three senatorial zones of Delta State (Delta North and Delta Central) were covered in this study as the communities that met the inclusive and exclusive criteria are all located within these two zones. Furthermore, the study was limited to a period of 7 years (2015-2021), hence only communities that had experienced persistent herders-farmers crises within this period were included in the study.

Figure1: Map of Delta State

Inclusion Criteria

The inclusion criteria for the selection of sample community include the following;

iv. The community must have farmers and herders' settlements.
v. The community must have experienced farmers-herders clashes at least once in a year.
vi. The community must have experienced farmers-herders clashes repeatedly in the last five years.

Data collection method

Data for the study was collected through one-on-one interviews. These interviews were conducted using an interview guide developed by the researchers. The interview guide contained five open ended questions aimed at determining the various peace-building approaches being used by Delta state government in addressing the issue of farmers-herders crisis in Delta state as well as determining why these approaches have failed in the state.

A total of 30 participants were purposively selected and interviewed for the study. In each of the community that met the inclusive criteria, the interviewed participants were purposively selected based on the leadership position they held in their respective stakeholder group. This comprised of farmers, herders, traditional, and community leaders. Furthermore, officials from the Delta State Ministry of Agriculture and Delta State Livestock Management Committee included in the interview group were selected based on their roles as officials involved in government efforts in addressing the farmer-herder crisis in the state. This consisted of one staff of Delta State Ministry of Agriculture and two members of Delta State Livestock Management Committee. The breakdown of the interview participants according to their communities and stakeholder group is presented in the Table 1.

Table 1: Breakdown of group distribution

S/N	Community	Herder	Farmer	Traditional/community leader	Total
1	Emuhu community	1	1	1	3
2	Okapanam community	1	1	1	3
3	Umuachi-Afor community	1	1	1	3
4	Obulu-Uku community	1	1	1	3
5	Uwheru community	1	1	1	3
6	Avwon community	1	1	1	3
7	Unenurhie community	1	1	1	3
8	Agadama community	1	1	1	3
9	Ohoror community	1	1	1	3
10	Government Officials				3
					30

Each participant was interviewed, one on one, by the researchers and two research assistants with the aid of the interview guide. All the interviews conducted were recorded using an electronic device (phone), this was done in order to for record purpose as well as for eventual transcription. The interviews were conducted between January 2022 to March 2023, a period of 15 months. The inductive approach to thematic analysis was used to analyse the data acquired from various interviews.

Result

Using literatures, and the various interviews conducted by the researcher; several strategies that can help tackle the problem of farmer-herders' crises in Delta State were identified. These strategies if effectively implemented will result to lasting and enduring peace in the various communities plagued by the crisis in Delta State. Below are the identified strategies:

1. The use of dialogue as a mean of tackling the reoccurring crisis and resolving the conflict, and

supporting local peace accords between the farmers and the herders.

2. Education and Orientation of Farmers and Herders

3. Ranching

4. Security Measures (Policing, Arrest and Prosecution)

5. Creation of Cattle Routes

The development of the identified themes are as follows:

The use of dialogue as a mean of tackling the reoccurring crisis and resolving the conflict, and supporting local peace accords between the farmers and the herders.

Searching through literatures, the use of dialogue is the most proposed strategy that has been put forward by notable authors as a mean of tackling the farmer-herders; crisis in Nigeria. Authors like Udemezue, Ede and Udeji (2018), Nwobi (2018), Njoku (2018), Ajibefun (2018), Chukwuemeka et al. (2018), Ogo-Oluwa (2017), Johnson et al. (2017), Ogbeide (2017), Idowu (2017), Eje et al. (2017), ICG (2017), Dimelu et al. (2016), Audu (2014), Okoli and Atelhe (2014), Adekunle and Adisa (2010), and Adebayo and Olaniyi (2008) have proposed different ways of using dialogue in the resolution of the herders-farmers conflict. They all agreed that using this strategy at the community levels will engender effective communication between the two main stakeholders of the crisis. As conflict is an unavoidable situation in all human setting, the best approach in tackling conflict is by detecting it early and properly managing it. This measure has been shown to have helped in forestalling the conflict and preventing its escalation between the levels of the individual and the group, and the group and the communal.

By using this strategy in Delta State, the problem of reoccurring crisis between the farmers and herders can be adequately contained through effective dialogue between the herders and the farmers. By constantly encouraging dialogue between the warring groups through the organization of regular meeting between the groups where issues that affect their co-existence in the communities are discussed and any lingering grievances are addressed immediately before it snowballs into an all-out crisis.

The use of dialogue as an effective strategy in tackling the farmers-herders' crisis in the communities was also affirmed by the stakeholders during the interviews.

A traditional leader in Okapanam community recommended this strategy during an interview:

> *"Although, the government have initiated some form of avenue (regular town hall meetings in the communities) that facilitates dialogue between the farmers and herders; this is not enough to guarantee peace between the two stakeholders. The two groups, facilitated by their leaders, should engage in regular dialogue to discuss issues that pertains to their peaceful co-existence. This will help forestall crisis between the groups by helping in resolving grievances before it comes too big to contain."*

Another community leader from Unenurhie community in Ughelli North Lga also affirmed the importance of dialogue as a mean of creating a peaceful interaction between the two stakeholders. According to him:

> *"When people talk about everything, the chance of them having quarrels that will lead to crisis are reduced. Also, most the issues that have led to crises between farmers and herders in this community are trivial issues that should have been resolved if there is an avenue where the two stakeholders can have a meaningful dialogue. So, government should help us to create an avenue where the two stakeholders can have regular dialogue on genuine issues that borders on the co-existence in the community."*

Furthermore, the senior staff at the Ministry of Agriculture and Agriculture and Natural Resources affirmed the efficacy of regular dialogues between the stakeholders. In his affirmation, he stated that;

> *"We have found that the town hall meetings that have been conducted by the ministry in some of the communities have yielded some positive result by facilitating peaceful co-existence between the farmers and the herders. These meetings gave the two groups an avenue to dissipates some angers and express their feelings about recent happenings in the communities."*

However, the dialogue has to be consistent for it to create the needed peace in the communities. This has not been the case with the regular town-hall meeting initiative of the government. Both the state officials and the two stakeholders blame each other for the lack of consistency in the meetings.

According to a community leader in Ughelli North Local Government Area:

> *"The government only come for the meeting once in a while. The meetings are not frequent, this has limited the opportunity for dialogue with the community, the herders and the farmers."*

The above narrative from the community leader indicates that the initiative for dialogue must be carried out by the government. This should not be the default, dialogue between the farmers, herders and community leaders should be something that any of the aforementioned stakeholders should always initiate. This was the opinion of the ministry staff:

> *'The communities should not always wait for the government before they organize meeting between the herders and the farmers. They should have a specific time among themselves. The government has lot of things in its hand; therefore, it is important that the various groups try to gather themselves and talk about issues before it becomes a crisis."*

Education and Orientation of Farmers and Herders

Another major strategy that was put forward by the stakeholders is the act of educating the farmers and herders on the importance of peaceful co-existence. This was also buttressed by literatures like Oli et. al. (2018), Ajibefun (2018), Eje et al (2017), Umoh (2017), Ogbeide (2017), Dimelu et al. (2016), Audu (2014), Aliyu (2015), Okoli and Atelhe (2014), Abbas (2011), and Adekunle and Adisa (2010) who have all recommended education and reorientation as a proven way of tackling farmers-herders crisis.

The implementation of this method is crucial due to the prevailing lack of education and awareness among a large number of herders and rural farmers regarding government laws, policies, and programmes, which hinder peaceful coexistence. According to a community leader in Unenurhie community in Ughelli North Lga.

> *"Most of the herders are illiterate and lack the basic knowledge of peaceful co-existence. Therefore, it is important that they are given some form of education and reorientation in order to prepare them for the demands of living among people with different ideas, culture, language and orientation."*

Education and orientation of farmers and herders was also suggested by some leaders of the herders:

> *"You know we are not used to Western education and due to the nature of our occupation (sic: nomadic nature); our people tend to only live the nomadic/Fulani way of life which is different from the kind of life the Southerner lives. These two different ways of lives tends to cause some tension between the two groups. Therefore, there is need to education our people on the how to live with people with a different way of life. This can only be done through proper education and orientation."*

Conclusion

The enduring conflict between farmers and herders in Delta State, as well as across Nigeria, presents a multifaceted challenge with far-reaching consequences. The loss of lives and livelihoods due to this conflict underscores the urgent need for effective interventions. Through an examination of existing literature and qualitative interviews, this study has identified several strategies that hold promise in addressing the farmers-herders crisis in Delta State. Dialogue emerges as a central and widely endorsed approach for conflict resolution. Notable authors and stakeholders alike emphasize the importance of fostering communication and understanding between farmers and herders through regular dialogues and local peace accords. The testimonies of community leaders and government officials underscore the potential of dialogue in mitigating grievances and preventing the escalation of conflicts. Furthermore, education and orientation initiatives for both farmers and herders are recognized as essential components of long-term peacebuilding efforts. By increasing awareness of government policies, fostering cultural understanding, and promoting peaceful coexistence, education can address underlying tensions and facilitate mutual respect among diverse communities.

Recommendations

Ranching, security measures, and the creation of cattle routes are additional strategies identified through this study, each offering unique contributions to conflict mitigation. However, the effectiveness of these approaches must be evaluated within the context of Delta State's specific socio-political landscape, considering factors such as local traditions, resource availability, and governance structures. While the study provides valuable insights into potential pathways for peacebuilding, it also highlights the need for continued evaluation and adaptation of strategies to address evolving challenges. Consistent dialogue, collaboration among stakeholders, and sustained government commitment are essential for the successful implementation of these interventions. In moving forward, it is imperative for policymakers, community leaders, and civil society organizations to work collaboratively to implement and refine these strategies, taking into account the perspectives and needs of all stakeholders. By fostering a culture of dialogue, promoting education and awareness, and implementing targeted interventions, Delta State can make significant strides towards resolving the farmers-herders conflict and fostering lasting peace in affected communities.

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A CRITIQUE OF POSITIVISM AND THE IDEA OF A UNIFIED SCIENCE

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Abstract

The problem of which method is suitable for the study of the subject matter of the social sciences – human behaviour in group – is a matter of debate among philosophers and social scientists. Positivists insist that the social sciences should adhere to the scientific method of the physical sciences. This is based on their assumption that the method of the physical sciences is the sole model for acquiring reliable knowledge. The Paper argues that positivism is inadequate and a methodological misfit for social inquiry. This inadequacy we maintain results from the fact that positivism is hinged on a monistic ontology that fails to recognize the interconnectedness of the complex web of social reality and the uniqueness of the subject matter of the social sciences. The paper aims to show the problems inherent positivism as methodology for the social sciences. The critique adopts the method of content analysis and concludes that positivism is inadequate for social inquiry as a result of the peculiarities of the subject matter of the social science vis-à-vis that of the physical sciences. Hence, it recommends complementary approach whose ontology recognizes the interwovenness of the dimensions of social reality and places a premium on the complementation of methods for social inquiry.

Keywords: Science, Social Science, Positivism**.**

Introduction

The philosophy of the social sciences critically examines the methods, concepts, logic and the epistemic foundations or philosophical assumptions which underpin the practice of social inquiry. The critical role philosophy plays in the conception of methodologies of the social sciences roughly exposes the broader subordination of the social sciences to the natural sciences (Delanty & Strydom, 2003, p. 4). Thus, some of the leading proponents of this traditional perspective of philosophy of the social science were positivists, like Auguste Comte, Emile Durkheim, Hebert Spencer, John Stuart Mill, the Logical Positivists of the 1930s and a host of others. These positivists see science as an “attempt to gain predictive, and explanatory knowledge of the external world” (Urry & Keats, 1975, p. 4) and to do this, “one must construct theories, which consist of highly general statements, expressing the regular relationships that are found to exist in the world” (Abcarian & Palmer, 1974, p. 9).

In reaction to the positivist’s philosophy as a methodology for social inquiry, our definition and understanding of positivism shall be predominantly influenced by Comtian conceptualization of positivism. For Comte, the social sciences and particularly, sociology or *social physics* – as he initially called it – is to study society using the positivist method of the physical sciences (Comte, 2000c, p. 33). Thus, this paper is precisely concerned with positivism as a method for sociology or the social sciences. Contrary to the view of positivist the paper argues that positivism is inadequate for social inquiry. Structurally, the paper is divided into three sections with a conclusion.

Conceptualization of positivism

There is an array of definitions of the term *positivism.* Basically, it is a term with many uses in the social sciences and philosophy. Generically, “it embraces any approach, which applies scientific method to human affairs conceived as belonging to a natural order open to objective enquiry” (Hollis, 1994, p. 41). In a much broader sense, the term positivism “goes with an empiricism about scientific knowledge, which rests on observation as moment of truth, when hypotheses are tested against the facts of the world” (Hollis, 1994, p. 41). Central to the notion of positivism regardless of which of the positivists’ view is adopted, is the belief that we cannot claim to possess knowledge of anything but observable phenomena and the relations between them (Urry and Keats, 1975, p. 71). As a method, positivism is associated with the belief that the procedures of the physical sciences are the sole model for acquiring reliable knowledge (Rickman, 1967, p. 1). As a doctrine, positivism maintains that “the study of the human or social world should be organised according to the same principles as the study of the physical or natural world. In simple terms, positivism maintains that the social sciences should be modelled on the natural sciences” (Ritzer 2005, p. 571). “The science positivists envisaged and practiced relied on an epistemic merger between nature and society: the laws of nature and the laws of society were perceived as analogous or identical, requiring related methods of inquiry” (Hollis, 1994, p. 2). Positivism sought to unravel the rules nature and society obeyed. In reaction to the positivist’s philosophy as a methodology for social inquiry, our definition and understanding of positivism shall be predominantly influenced by Comtian conceptualization of positivism.

Positivism and the notion of a unified science

The philosophical conceptualization of positivism can be traced back to as early as the late eighteen and nineteen century. In elaborately detailed form, discourses pertaining to how best social inquiry can be carried out can be found in the works of English philosopher and political economist, John Stuart Mill (1806-1873) and the French philosopher and supposed founder of sociology and positivism, Auguste Comte (1798-1857). Both Auguste Comte and J. S. Mill hoped “to present a unified view of man’s knowledge through the unity of science” (Backhouse & Fontaine, 2010, p. 2). For these two philosophers, the social sciences were in fact not in any way considered distinct from the physical or natural sciences to warrant the necessity for a new and distinct methodological approach in the investigation of its subject matter. “Positivism as a research approach is based on the ontological principles that there is an objective reality which is free and independent of viewer and waiting to be discovered” (Aliyu, Bello, Kasim, & Martin, 2014, as cited in Ali et al, 2021, p. 20). It is based on the assumption that if there is any reality, it can be known and explored through rigorous research.

Comte maintains that the social sciences particularly, sociology is not distinct from but is an integral part and an upshot of the evolutionary and progressive development of human knowledge from the three stages of progression; namely; the theological, metaphysical and the positive stages. His positivism is founded upon the certainties or reliability of science. According to Comte "what was needed was a basis of intellectual, moral and social life. This would be provided by the methods, findings and instrumental utility of science. The social sciences would as such, be the crowing pinnacle in this new order" (Urry & Keats, 1975, p. 71). Comte maintains that there existed a hierarchy of the sciences "with mathematics at bottom and sociology at the top" (Comte, 2000b, p. 25).

The positive philosophy of Comte is essentially founded on the belief that human knowledge is fundamentally about empirically observable phenomena and of the relations between them. Thus, the social sciences are science, which shall study observable human behaviour and their relation by utilizing the scientific method. This he believes shall lead to the discovery of social laws governing human behavior just like the law of gravity. The demarcation of a scientific from a nonscientific statement, for Comte, is based on the criterion of *testability,* which is not necessarily in terms of their certainty or infallibility. "Thus, scientific statements are those that make general claims about nature or society which are open to empirical control" (Urry & Keats, 1975, p. 75).

Comte assumes a striking similarity to the Cartesian tree of human knowledge –that is, the entire body of human knowledge is seen as a unified science. The trunk and each of the branches of the tree represents a particular field or discipline of human knowledge, hierarchically with mathematics at its root and sociology at the peak of the newest branch as the science of human society. Thus, for Comte, sociology was not only to utilize the methods of the natural science but is an integral part and offshoot of the sciences, and therefore a science and like other disciplines of the physical or natural sciences, the social sciences must utilize the scientific method. This is clearly a case of methodological reductionism wherein Comte like other positivists strongly believe that the human behaviour in group can be adequately explained in terms of the behaviour of the entities of the physical world and its method.

Like Comte, John Stuart Mill in his *A System of Logic* (1843) and *Auguste Comte and Positivism* (1865), held that any phenomenon, which displays regular or similar patterns of behavior was fit for scientific investigation. Given that all natural phenomena apparently displayed such regularities, including human behavior, they are subject of causal explanation, which is of the realm of science as such. For Mill, there could not be two phenomena, one natural and the other non-natural; humans are part and parcel of the natural world. "Mill believed that all phenomena belong to a single natural world, and that the same kinds of scientific procedures are appropriate throughout, more particularly, in relation to the study of man in society" (Mill, 1898, as cited in Urry & Keats, 1975, p. 75). Consequently, Mill argued that the social sciences be modelled upon the existing paradigm of Newtonian mechanics.

Mill wrote extensively on what he thought ought to be the proper character and methodology of the social sciences. Mill endorsed Comte's belief in the possibility of a science of society but disagreed on some significant details with Comte on the proper procedure by which positivism sought to investigate social phenomena. Unlike Comte, Mill admits to the inherent differences that exist between the nature of the subject matter of the social sciences and those of the physical sciences. Nevertheless, like Comte he went on to insists that the method of the physical sciences will be appropriate for social inquiry on the grounds that all phenomena (including social phenomena) belong to a single natural world. Therefore, similar scientific procedures are appropriate throughout (Mill, 1898, p. 823). This chain of arguments is expressed in the following lines:

> It is a common notion, or at least it is implied in many common modes of speech, that the thoughts, feelings, and actions of sentients beings are not a subject of science, in the same strict sense in which this is true of objects of outward nature…The science of human nature falls far short of the standard of exactness now realized in astronomy, but there is no reason that it should not be as much a science (Mill, 1898, p. 823).

Furthermore, Mill reacts to the degree of certainty inherent in Comte's positivism as an adequate method for social predictions. He in fact asserts his skepticism that "the actions of individuals could not be predicted with scientific accuracy because we cannot foresee the whole of the circumstances in which those individuals will be placed" (Mill, 1898, p. 823). From this, Mill proceeds to assert that:

> Even if our science of human nature were theoretically perfect, that is, if we could calculate any character as we calculate the orbit of any planet, from given data still, as the data are never precisely alike in different cases, we could neither make positive predictions, nor lay down universal propositions (Mill, 1898, p. 824).

This admittance by Mill on the relative nature of social phenomena and the ineptitude of positivism as a method, which is intended for social prediction with scientific accuracy exposes positivism to the attack of interpretivists or relativists. Thus, the discovery of law-like relations as intended by positivism becomes difficult if not impossible given the epochal or geographical contingency of human behavior. Explanation therefore, inherently becomes not universal but relative. Positivism unlike most microlevel sociological models of inquiry, like symbolic interactionism, rarely pays much attention to the individuals like it does to the idea or concept of society. Mill made attempts to help examine the benefits of the positive method but at the same time, he left unaddressed the question concerning the adequacy of Comte's positivism and the idea of positivism in general in the investigation of the complex web of social reality which is an extremely multifarious phenomenon.

The French sociologist and theorist, Emile Durkheim (1858-1917) is another scholar interested in the problem of methodology in the social sciences. He subscribes to Comte's positivism but certainly not without his criticism of it. In his work *The Rules of Sociological Method* (1895) which he intends to serve as a manifesto on behalf of the course of sociology, he laid down the standards whereby sociology was to be judged as a science. "Almost single-handed he forced the academic community to accept sociology as a rigorous and scientific discipline" (Swingewood, 1984, p. 1). In his *The Rules of Sociological Method* (1895) Durkheim presented the first major methodological study of sociology, wherein he observed that none of the nineteenth century sociologists (neither Comte, Mill nor Spencer) properly dealt with the methodology of sociology. Despite admitting Comte's contributions to sociology, Durkheim went on to maintain that Comte "hardly went beyond generalities concerning the nature of societies, the relationships between the social and the biological realms and the general march of progress" (Durkheim, 1938, p. 48). The opening lines of his introduction to his work *Rules of Sociological Method* 1982 Durkheim explicitly stated that: "Up to now sociologists have scarcely occupied themselves with the task of characterizing and defining the method that they apply to the study of social facts" (Durkheim, p. 48). Thus, it is the problem of an adequate method for social inquiry that led him to assert that he has "worked out a better-defined method, one which is believed to be more exactly adapted to the specific nature of social phenomena" (Durkheim, 1938, p. 49). Durkheim accepts that Mill made attempts at tackling the problem of an appropriate methodology for the study of society, but he thinks that Mill "merely submitted to the sieve of his own dialectic what Comte had said upon it, without adding any real contribution of his own" (Durkheim, 1938, p. 48).

Therefore, Durkheim was majorly concerned with the task of defining the object of study of sociology as a scientific discipline and the appropriate method for social inquiry. He refined positivism as originally set forth by Auguste Comte, promoting what could be considered as a form of epistemological realism, as well as the use of the hypothetico-deductive model in social science (Durkheim,p. 62). He showed concern for the nature and particularity of historical development unique to individual society, and criticized Comte's positivism for majorly seeking to construct systems of general laws on the basis of which particular events could be explained (Durkheim,p. 81). Sociology's aim, he maintains is to discover structural social facts. In his view, "social science should be holistic that is, sociology should study phenomena attributed to society at large, rather than being limited to the specific actions of individuals" (Durkheim, 1938, p. 14). Society as Durkheim rightly maintains, "is not the mere sum of individuals, but the system formed by their association that represents a specific reality which has its own characteristics" (Durkheim, 1938, p. 129). Like Comte, Durkheim vehemently repudiates the idea that mysterious metaphysical or theological forces are responsible for producing the empirically observable phenomena witnessed in the natural world. He sets out to lay a method and a body of knowledge –a realm of phenomena to be studied scientifically. "The realm consists of social facts, those morphological, demographic and ecological features, legal rules and institutionalized norms, established beliefs and practices, and institutionalized social currents, which constitute the organization of society into which any member is born and continues to act" (Durkheim, 1938, p. 42). He defines social fact as things or externally constraining realities that requires to be studied objectively from the outside. For him the underlining assumption of the positivistic doctrine as being ready to hand, immediately, and factually given, could be social-scientifically interpreted. This implies that the social sciences should be primarily or entirely concerned with the investigation and study of these social facts –patterns of behavior that characterizes a social group –which are empirically observable. It is the business of social scientists says Durkheim, to uncover social facts and to explain them (Durkheim,63). Therefore, when sociologists engage in explaining social phenomena, “the efficient cause which produces it and the function it fulfils must be investigated separately” (Durkheim, 1938, p. 123). Like Mill, Durkheim insists that the method to be employed by sociologists in the explanation of social phenomena must essentially be psychological (Durkheim,p. 125), and his reason for this is predicated upon the following lines of assumptions and arguments:

> Indeed, if society is only a system of means set up by men to achieve certain ends, these ends can only be individual, for before society existed there could only exist individuals. It is therefore from the individual that emanate the ideas and needs which have determined the formation of societies. If it is from him that everything comes, it is necessarily through him that everything must be explained. Moreover, in society there is nothing save individual consciousnesses, and it is these that is to be found the source of all social evolution. Thus, sociological laws can only be a corollary of more general laws of psychology (Durkheim, 1938, p. 125).

Sociological explanation according to Durkheim shall consists exclusively in establishing of relationships of causality, by this he meant that sociologists must be able to link a given social phenomenon to its cause, or on the contrary, a cause to its effects (Durkheim,p. 147).

Durkheim’s emphasis on the objective study of social fact fails to take cognizance of the fact that “not all reality is objective, for not everything is best understood the more objectively it is viewed. Appearance and perspective are essential parts of what there is, and in some respects, they are best understood from a less detached standpoint” (Brewer, 2013, p. 22). This is particularly the case with certain dimensions of social reality which cannot be externally studied objectively as Durkheim thought. For Instance, social action is subject to the meaning of the agent who acts in a particular manner and the interpretation of the observer. In the course of social inquiry, sociologists are faced with the question of how best to evaluate or interpret the meaning of an actor’s action particularly, the subjective interpretation of the actor. This points to the relevance of an interpretive framework in order to make sense of social action. Therefore, in reaction to Comte’s positivism as inadequate, monistic and reductionistic, Durkheim never entertained the thought of a need for an interpretive dimension to social inquiry in his methodological writings in sociology. This makes his proposed emphasis on social fact a problem for a holistic inquiry of the multidimensionality of social phenomenon.

Apart from the position of these positivists, the latter positivists who came to be known as *logical positivist* maintain similar position like the former positivists on the issue of an appropriate methodological approach for the social sciences. The positivism of social scientists of the eighteenth and nineteenth century differs historically from that of the philosophical movement of Logical Positivism or members of the Vienna Circle. Avrum Stroll described Logical positivism as “a radical form of scientism that holds that only the special sciences can make cognitively meaningful statements about the world” (Stroll, 2010, as cited in Popkin, 1999, p. 621). Fundamentally, the logical positivist based their outlook on “the new logic as the provider of an ideal language and on the notion that science alone is capable of providing a true account of reality” (Popkin, 1999, p. 621). The former positivists and the logical positivists both agree that any attempt to go beyond what is observable leads science into unverifiable metaphysical claim.

Critique of the positivists’ doctrine

These positivists apart from their unanimous agreement on the utilization of scientific method as a sole methodological approach for inquiry in the social sciences, and their emphasis on empirically observable phenomenon, they fail to see the convolutions of the subject matter of the social science. The convolutions and dynamics of the nature of the subject matter of the social sciences – human behaviour in group – makes the positivist’s position unnecessarily stringent, exclusive, monistic and reductionistic in such a manner that hampers social inquiry. These positivists collectively maintain the view that the social sciences and even humanities fundamentally have the same aims and methods as the natural sciences, this erroneous assumption has warranted the manifestation of methodological monism and reductionism within the diverse spectrum of positivism. Also, positivism "as a descriptive account of empirical science is too narrow and as a methodological programme it is a too restrictive brand of empiricism" (Giedymin, 1975, p. 275).

Positivism desperately attempts to fill the gap between natural and social sciences. The positivist believes that "events in social world, which lend themselves to discovery neither occur at random nor are they pre-destined by fate. Instead, happenings in social world are same like those of natural world, explained in terms of causes and effects with one phenomenon leading to another" (Nudzor, 2009, as cited in Ali et al., 2021, p. 21). This monistic ontology of the positivists fails to take into consideration the complex web of social reality that is intertwined with several intricate social conditions, factors or phenomena such as culture, historical epoch, gender, religious and political disposition, tribe, nationality, marital status etc. Unlike the positivists' assumption of reality or matter, human behavior is convoluted and dynamic in such a manner that it carries different meanings over time. Hence, it is almost impossible to be studied from objective lenses. Rather, human behaviour is better understood from context. The ontological perception of the positivists fails to identify reality first as plural and second, the positivists fail to see that social reality is interconnected and their monistic ontology which has necessitated their suggestion for a single method is unfit to capture the interconnected plurality of social reality. Positivism, Roscoe maintains insists on going much further. As a method of social inquiry, "it seeks to identify a second order of (scientific) interpretation behind the first order ethnographic interpretations – a totalizing theory embodying transcultural laws and causes that account for behavior both within and among human societies" (Roscoe, 2001, p. 499). This positivist quest he points out is fatally flawed. “It erroneously presumes a *determinism* of human action” (Roscoe, 2001, p. 498) and thus considers human behavior to be analytically similar with the physical or biological matter and its behavior.

Positivism is restrictive in such a manner that it seriously comes in the way between sociology or the social sciences and its most distinctive feature from the natural sciences. Man as a being is influenced by society, his beliefs, ideology, feeling and attitude sometimes conspicuous and at other time subtle. These form part of the uniqueness of man as distinct from inert matter studied in the natural sciences. As Ozumba rightly noted, “understanding human existence, interpreting human affairs” we need to possess a “rigorous philosophical attitude which takes into consideration, the spiritual and the mundane dimensions of human existence and reality” (Ozumba, 2010, p. 22). Ekekwe describes social scientist who deny the spiritual essence of humans as still living in Plato’s cave. A method of social inquiry, that fails to take cognizance of this is mistaken and contributes to the misunderstanding of distorted understanding of man and society (Ekekwe, 2019, p. 20). Hence, any methodological framework to be adopted in the study of man and society should be holistic enough in approaching issues of knowledge as they affect humans both directly and indirectly or externally and internally.

Unlike positivism, the method of complementarity seeks to explore the close relationship between ideas, action, and human interests (Asouzu, 2007, p. 6). Complementarity as a method, is based on a “philosophical mindset that the world can use the enormous means at its disposal to confront some of the daunting problems of our time adequately” (Asouzu, 2004, p. 10). All forms of epistemologico-methodological monism whose methods seeks to exclude, a priori, certain aspects of reality from the subject matter of authentic epistemology is repudiated by the principle of complementarity (Asouzu,p. 408). The assertion that anything that exists serves a missing link of reality naturally forms a central methodological thesis of complementary reflection as a philosophy of integration and transformation. Thus, the social sciences stands a better chance of understanding, explaining, and predicting the behaviour of its subject matter through the instrumentality of complementary approach than positivism.

Conclusion

The overt emphasis by positivists on the study of only empirically observable phenomena debars social sciences from certain dimensions of the multifaceted or complex web of social reality of man and society. Positivism is too stringent and approach, it is an expression of methodological monism whose method seeks to exclude, a priori, certain aspects of reality by simply equating knowledge with that which is empirically verifiable and arrived at only by means of scientific method. This therefore makes positivism an inadequate approach for the understanding, explaining and predicting social phenomena.

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A COMPLEMENTARIST CRITIQUE OF WENCESLAO GONZALEZ'S METHODOLOGICAL PRAGMATISM AND PLURALISM IN THE PHILOSOPHY OF THE SOCIAL SCIENCES

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Abstract

This paper is a complementarist critique of Wenceslao Gonzalez's methodological pragmatism and pluralism as a philosophy of the social sciences. Gonzalez's reaction to the limitations of methodological monism is predicated on the assumption that these monistic models presuppose monistic social ontological framework. The paper, which is a reaction to this assumption identifies ontological discontinuity with monism and as a property of approaches in the social science. The need to resolve the problem of discontinuity gleaned in the approaches to social inquiry is both a motivation and the problem of the paper. To address this problem, the study critically exposes the monistic, bare pluralistic and constructivist ontology or disposition in the methodology of the social sciences whether in the form of positivism, interpretivism or critical theory. It investigates Gonzalez's proposal of methodological pragmatism and pluralism and its ontological presuppositions in order to ascertain its adequacy for social enquiry. Lastly, it proposes the method of complementarity as a viable option for social science research. To achieve these, we adopted the method of content analysis. It was discovered that Gonzalez's conception of social realities is anchored on complementarist ontology that perceives social reality as a complex web of interconnected relations despite this being implicit in some areas of his work. Hence, the study concludes that social reality properly understood is not monistic or just a plurality but an interwoven plurality. As such, the most appropriate approach to the study of such a reality is a complementary methodology. What is novel about the study is the identification of social reality as not just plural but an interwoven plurality, with an attendant recommendation of the method of complementarity as a necessary approach for the study of such a reality.

Introdcution

The paper is a reaction to the problem of methodological monism and several attempts within the philosophy of the social sciences to resolve it. Methodological monism which finds expression in the form of positivism, interpretivism, critical theory, or any other exclusivist approach in the social sciences research which has hampered epistemologico-methodological progress of social inquiry. Gonzalez's methodological pragmatism and pluralism attempts to address the problem of monism. The ontology presupposed by the approaches to social inquiry (positivism, interpretivism and critical theory) is either monistic or merely pluralistic in such an unconnected manner. This discontinuity which is found in all of them and the monism found in some of these approaches is the reason this paper. The paper therefore, deals with the philosophical issue pertaining to methodological approaches in social sciences.

Attendant to the problem of the failed attempt of the social sciences in proffering a functional method in understanding man, we have the problem of the prevalence and panoply of social problems bedeviling society. The social sciences when placed in comparison with the natural sciences have not made significant progress or as some argue, it has failed in proffering solution to the innumerable social problems humans face. For progress to be made, some philosophers of the social sciences and social scientists believe that there would be a need to re-evaluate the methodology of the science (Comte 1830; 1842, Nagel 1961, Rosenberg 2016, Collingwood 1933, Delanty & Strydom 2003). Although their postulation with regards to what method would be appropriate for social inquiry may differ individually, the vast majority of them at least admit that the major problem with the social sciences is one that pertains to methodology. This submission constitutes a major motivation for this paper.

The problem of methodology in the philosophy of the social sciences

The task of how best to inquire, understand and present a wholistic account of human behaviour in group which is the subject matter of the social sciences, constitutes a methodological problem in the discourse of the philosophy of the social sciences. "The field of social science methodology has been hyperactive over the past several decades. Methods, models, and paradigms have multiplied and transformed with dizzying speed, fostering a burst of interest in a heretofore moribund topic" (Gerring, 2012, p. xix). John Gerring again points out that: "One sign of the growing status of this field is the scholarly vituperation it inspires. Terms such as interpretivism, rational choice, poststructuralism, constructivism, randomization, positivism, and naturalism are not just labels for what we do; they are also fighting words" (p. xix). Hence, for some decades now, Gerring continues, "methodological disagreements have largely displaced disagreements over substantive issues as points of conflict" (p. xix). It is for this reason that Gerring opines that "methodology, not ideology, seems to define the most important cleavages within the social sciences today" (p. xx). It is this methodological conflict Gerring describes and its underlying monistic or absolutist proclivities that this study challenges.

In the social sciences, the human person becomes not just the inquisitive subject but also the object of enquiry. The human person as a being is influenced by society, his beliefs, ideology, feelings and attitude, sometimes conspicuously and at other time subtly. These form part of the uniqueness of humans as distinct from other entities studied by the physical sciences. As Ozumba rightly notes, “understanding human existence, interpreting human affairs” we need to possess a “rigorous philosophical attitude which takes into consideration, the spiritual and the mundane dimensions of human existence and reality” (Ozumba, 2010, p. 22). Ekekwe describes social scientists who deny the spiritual essence of humans as still living in Plato’s cave. “A method of social inquiry, that fails to take cognizance of this is mistaken and contributes to the inadequate or distorted understanding of man and society” (Ekekwe, 2019, p. 20). Furthermore, Alawa rightly asserts that man is a composite being that comprises body and soul but “the mystery is that man does not understand himself and that is the problem” (Alawa 2016, p. 37). How then can the social sciences proceed to understand this being called man and human behaviour in group which is its subject matter? In addition, when man barely understands himself how can social scientists and philosophers proceed to propose a method that can appropriately and wholistically inquire into the convoluted nature and behaviour of man; especially in the face of methodological monism and exclusivist approaches prevalent in the inquiry?

The fundamental methodological assumption upon which the social sciences proceed in their understanding of man is that “human behavior is determined in the same way that other natural phenomena are determined: that potentially every human act can be understood as a result of antecedent factors which operate to make the act inevitable" (Glock & Stark 1965, p. 294). This assumption has been under attack, because it gives rise to one of the dominant methodological assumptions (positivism) which this study challenges. The theoretical implications of monistic, absolutist, and constructivist disposition inherent in the methodologies of the social sciences (particularly, in positivism, interpretivism, or critical theory) has been an issue in the philosophy of the social sciences.

Gonzalez’s methodological pragmatism and pluralism

It is in consideration of the context, both the routes of the historical approach and the predominant thematic view in the philosophy of the social science in general and more precisely, its methodological problem that attracted Gonzalez to the issue.

Gonzalez's methodological pragmatism and pluralism is a proposal he considers as a more open approach for research in the social sciences. He contends against what he considers an arbitrary partition of the discipline into factions defined largely by methodology. He maintains that a great deal of the social science in practice operates between the various polar opposites and that combinations of methods and approaches are in fact possible contrary to what most positivists would have us believe. He rebuts the idea or assumption that there is in fact a "single division running from ontology and epistemology through methodology to methods and presents the social sciences as a field, through which various pathways are possible" (Gonzalez, 2020, p. 12). Precisely, his doctrine of methodological pluralism defends the different approaches of social inquiry without necessarily maintaining that any one of them is the best way of comprehending social ontology. Tired of never-ending attrition of methodological debates, Gonzalez advocates what he considers a practical, broad, and tolerant approach for research. His idea of methodological pragmatism is essentially a product of Nicholas Rescher "believes that the spirit of pragmatism can be rescued by focusing on the success of methods rather than on that of beliefs" (Gonzalez, 2015, p. 37). In principle, it "seeks to legitimatize knowledge claims by way of pragmatically justifying the methods used to settle on and support factual assertions" (Gonzalez, 2015, p. 38).

In chapter one of his work entitled *Pragmatism and Pluralism as Methodological Alternatives to Monism, Reductionism and Universalism*, he explicitly states that the crux of his methodological pragmatism is based on an emphasis on practice, that brings about efficacy in the realization of the collective goals of research, and the recognition of the diversity in scientific research, that is in tune with what he considers the polyhederal character of reality – natural, social, and artificial – and its ontological levels – micro, meso, macro contributes to the methodology of the social sciences (Gozalez, 2020, p. 1). Hence, he believes and asserts that "pragmatism and pluralism offer methodological alternatives to monism, reductionism and methodological universalism, and also to methodological imperialism" (Gozalez, 2020, p. 1). It is in this regard that he proceeds to maintain that; "the emphasis on the progress of science as a human activity, rather than a mere content oriented to a cognitive goal, and the inquiry made according to the kind of object and scale of reality studied (micro, meso, and macro) can support the advantages of pragmatism and pluralism as philosophico-methodological prospects for scientific research" (Gozalez, 2020, p. 2).

Furthermore, Gonzalez points out that "the existence of complex systems in the world (natural, social, and artificial), both structural and dynamic, can play a role in favour of methodological approaches based on pragmatism or pluralism (or even a combination of both)" (Gozalez, 2020, p. 2). Thus, "the attention of human activity, the scale of reality and the structural and dynamic complexity can contribute to central features of the procedures and method used in the social science" (Gozalez, 2020, p. 2). He admits that both "pragmatism and pluralism are in principle, open to diversity of methods in science, in general, in a group of sciences (natural, social or artificial) and in specific sciences (physics, economics, computer science etc.)" (Gozalez, 2020, p. 3). The implication of this he maintains is that "they do not start from a macro--theoretical scheme of unity of science or from the need for a methodological unification of sciences, achieved through an effect of convergence (commonly based on logical, epistemological, or ontological criteria)" (Gozalez,p. 2). Also, he maintains that they (methodological pragmatism and pluralism) "normally consider the practice of science as a relevant factor rather than just focusing on the theoretical contributions of science, and they are generally sensitive to the import of context, (social, cultural, economic, etc.) for the advancement of science" (Gozalez, 2020, p. 2). Hence, he asserts that to a large extent, "these methodological approaches can overcome the key problems of monism, reductionism and methodological universalism as well as that of methodological imperialism pervading the social sciences" (Gozalez, 2020, p. 2). In addition, he points out that "the methodological components of pragmatism and pluralism can be considered in the semantic, logic, epistemological, ontological, axiological and ethical aspects of science" (Gozalez, 2020, p. 2).

Gonzalez opines that over the past few decades, the issues of pluralism has been presented in philosophy and methodology of science from two major perspectives. "First, from a general point of view, commonly according to four main approaches: naturalism (Dupre 1993), the social turn in science (Longino 1990), scientific realism (Cartwright 2004; Psillos 2009) and conceptions based on probability theories (Galavotti 2008)" (Gozalez, 2020, p. 4). The perspective he mentions is that, "in the analysis of positions within various sciences, be they disciplines investigating nature, such as biology (Mitchell, 1992, 1993), or researching society, as in the case of economics (Van Bouwel 2004)" (Gozalez, 2020, p. 4). In his estimation, "these analyses show a combination of novelty and continuity in philosophy and methodology of science" (Gozalez, 2020, p. 4).

With regards to methodological pragmatism, Gonzalez maintains that Nicholas Rescher published a book on the subject matter in 1977 and is a pioneer of methodological pragmatism. Since his (Rescher) work in 1977, Gonzalez points out that "methodological pragmatism with greater or lesser intensity and conceived from different epistemological angles – has often had supporters" (Gozalez, 2020, p. 4).

Moreover, he opines that the renewed interest in methodological pragmatism in science focuses on the relevance of science as practice, diversified according to goals sought, and its effects in achieving results. There has been an increasing attention to methodological pluralism in modes related to sciences itself, groups of sciences, and specific science. Therefore, Gonzalez points out that “the topic has become a trend for a new analysis in favour of polyhedreal vision of scientific research” (Gozalez, 2020, p. 5). This view is usually critical of methodological universalism and hence he “places emphasis on elements of diversity in scientific research in empirical sciences rather than seek a clearcut monism (i.e., a single, complete and comprehensive scheme of the world, as a whole, or of a given realm)” (Gozalez, 2020, p. 5). Gonzalez makes it clear that “methodological pluralism is in favour of taking into account the idiosyncracies of the disciplines rather than having a direct interest in a methodological imperialism (Gonzalez, 2020). It is in this light that Gonzalez understands, argues and proposes methodological pragmatism and pluralism as an approach that enables a wide spectrum of possibilities in the investigation of reality, in the case social reality. Underpinning Gonzalez’s proposal lies an ontological, logical, and epistemological structure and presuppositions of complementarity.

A complementarist critique of Gonzalez’s methodological pragmatism and pluralism in the social sciences

The approach of complementarity is suited to embrace the characteristic features of individuality of diverse methods in studying convoluted and dynamic social phenomena while at the same time clarifying the peculiar dimension of the observational position and its nexus with other dimensions of social reality given that its ontology is not merely pluralistic but an interconnected pluralism. The complementary approach allows social scientists to employ a combination of methods in observing, analyzing or theorizing about social phenomena. The method of complementarity allows for a platform from which to investigate, evaluate, and theorize about social phenomena and enables the utilization of diverse method in solving social problems in a variety of fields, whether in physics, psychology, sociology, or philosophy (Holton 1970, p. 191). Complementary acknowledges the ontological unity of social reality and on the basis of this recognizes the inter-relationships among all areas of reality, in this case social reality. Therefore, to adequately capture this interconnectedness complementarity approach permits for the combination of methods to enable a pluralistic rather than a monistic, reductionistic or exclusivist representation of social reality.

At the heart of the idea of complementarity is the insistence that the coexistence (within a given system) of two or more methods mutually enhances social research and theorization about social phenomena which social scientists seeks to understand. Complementarity aims at providing a method and some basic principles in view of penetrating reality in a consistent systematic way. “One of the major reasons for commitment to complementarity approach is that it helps the inquirer focus on his or her subject matter in an ordered coordinated manner as is provided by the dictates of the system which does not merely recognize ontological plurality of reality but the interconnectedness of ontological plurality” (Asouzu, 2007, p. 5). Ontologically, it is owing to the wholistic and non-exclusivist conception of the relationship between whole and parts or diverse dimensions of social reality that the complementary approach allows for a combination of method while recognizing their advantages and limitation for an inquirer. “It is only in a historical process, in practical situations of life and in the interplay and interrelationship of these parts with each other that the true and actual worth of social reality resulting from this interplay can be ascertained a posteriori and in concrete individual cases” (Asouzu, 2007, p. 40).

In exposing the complementarist ontological, logical, and epistemological structure and presuppositions in Gonzalez proposal, first, it should be noted that Gonzalez’s methodological pragmatism and pluralism does not only abhor but also repudiates all forms of methodological monism, reductionism, universalism and imperialism (Gonzalez, 2020 pp. 1-21), one significant and obvious strength of his approach for the social science is its flexibility. His proposal of methodological pragmatism and pluralism both theoretically and practically permits social scientists to employ a panoply of research tools, methods, techniques and approaches in their quest for knowledge of social reality rather than dogmatically adhering to one methodological approach solely because it is commonly accepted or dubbed *scientific*. All forms of ontological, epistemological and methodological monism and exclusivity in the quest for knowledge of social reality is considered an impediment to the social scientist task of understanding social phenomena. Gonzalez's methodological approach therefore permits a researcher to adopt the methods that are appropriate for his research problem and objective (Gonzalez, 2020, p. 19). This element of flexibility inherent in Gonzalez' approach allows a social scientist to understand and describe social phenomena which is often dynamic, convoluted and culturally determined. In line with Gonzalez's methodological pluralism, social scientists and philosophers would take into cognize that "different descriptions and different approaches are sometimes beneficial because some descriptions offer better accounts of some aspects of a complex situation and other descriptions provide better accounts of other aspects" (Kellert et al. 2006b,as cited in Gonzalez, 2020, p. 11).

Second, sensitivity to social context is a critical complementarist feature of Gonzalez's methodological pragmatism and pluralism for the social sciences. The nature of the subject matter of the social sciences is such that it is culturally and historically conditioned. As Martain Hollis points out, that context, or kind of context does not necessarily aid our understanding of an agent's action, but "the reasons for such action which stem from institutions are likely to be peculiar to those institutions. Hence, social action is rational relative to context; there is nothing universal about contexts" (p. 230). Furthermore, as Hollis points out, "granted that experience and logic underdetermine what it is rational to believe about the world, there is plenty of slack for conceptual schemes to take up in different ways. Cultures vary hugely in how they classify, conceptualise and order their experience" (p. 237). Thus, the social scientist cannot justifiably claim to have grasped the social reality of a people without this contextual sensitivity. Specifically, Gonzalez's doctrine of methodological pragmatism places a premium on the need for social scientist to take proper cognizance of the specific context in which he conducts his research. "It requires understanding why these techniques work, why one approach might be more appropriate for a given task than another, and how a given approach might be adapted to diverse research situations" (Gerring 2012, p. xxiii). It is for this reason that John Gerring thinks that "good work in the social sciences is necessarily creative work, and creative work requires broad grounding" (Gerring 2012, p. xxiii).

Third, diversity of method is another outcome of Gonzalez's approach for the social sciences, which is a critical feature of the complementarist approach. He consistently challenges the positivist's idea of a single reliable method for acquiring knowledge – scientific method. He maintains that there is no such thing as the best or sole method for doing science. With emphasis on context, he admits that the diversity of methods requires that different methods are in fact appropriate for addressing the panoply of research questions depending on which the researcher deems fit (Gonzalez, 2020, p. 2). Methodological pragmatism and pluralism demands "that results from more than one method of investigation are used to solve a (research) problem" (Hasson, 2010, p. 189).

This therefore means that social scientists ought to be open to the possibility of employing a variety of methods in their attempt at answering old and new research questions and solving social problems. By adopting multiple research methods and approaches, the convoluted and dynamic subject matter of the social sciences – human behaviour in group would inevitably manifest its nature and features to the research thereby mitigating the limitations of any single method (Gonzalez, 2020, p. 6).

Fourth, the explicit call for interdisciplinarity, trans-disciplinarity, crossdisciplinarity and multidisciplinarity is another palpable theoretical outcome of Gonzalez's pragmatism and pluralism for the social sciences. By drawing insights and techniques from the diverse fields of human endeavor, Gonzalez calls for collaboration of social scientists and researchers across disciplines. He believes this will aid in the final analysis of a wholistic and comprehensive understanding of the subject matter of the social sciences much more than the works of scholars whose approach to their research is highly specialized. This interdisciplinary approach he believes is capable of resulting in innovative solutions and new perspectives to both new and old recurring social problems that fraught society.

Gonzalez's methodological pragmatism and pluralism is a proposal he considers as a more open approach for research in the social sciences. He contends against what he considers an arbitrary partition of the discipline into factions defined largely by methodology. Hence, he maintains that a great deal of the social science in practice operates between the various polar opposites and that combinations of methods and approaches are in fact possible contrary to what most positivists would have us believe. He rebuts the idea or assumption that there is in fact a "single division running from ontology and epistemology through methodology to methods and presents the social sciences as a field, through which various pathways are possible" (Gonzalez, 2020, p. 12).

Lastly, Gonzalez's methodological pragmatism and pluralism has an ethical implication for the social science. As an inextricable facet of his proposed approach, Gonzalez consistently maintains that social scientists and researchers in general are saddled with the responsibility of ensuring that their work is in line with ethical standard and best global practices (Gonzalez, 2020, p. 23). Research in the social sciences is indispensable for understanding of our society and proper collection and analysis of social facts. This therefore implies that it is the duty of social scientist to meticulously take into consideration the potential impact of their work on society and direct participants of the research. And where necessary, measures must be taken to mitigate its inimical effect on stakeholders and participants.

Moreover, considering the sensitive and polarizing nature of some of the topical issues of the social sciences such as: Gender, Sexuality, Religion, Ethnicity, Race, Inequality, Social justice, Politics and policies, etc. In addressing some of these topical issues in the social sciences, social scientists have developed empirically grounded models in order to explain these social phenomena. "By examining sampled data, social scientists strive to develop theoretical models about causal mechanisms that, in ideal cases, reliably describe human behaviour and societal processes" (Salganik, 2023, p. 485). The complexity and dynamics of human behaviuor as the subject matter of the social sciences and other structural factors often constitute numerous challenges to social scientists.

Conclusion

The study concludes that the feasibility of Gonzalez's methodological pragmatism and pluralism for the social sciences lies in the need for complementation of methods for social inquiry and this need for the complementation of method is warranted by the complementarist ontology which is traceable in Gonzalez's thesis even if it is not often evident. This complementarist ontology perceives reality, in this case social reality, as a complex web of interconnected plurality. His overt emphasis on the need for the utilization of diverse methods does not undermine the necessity for the establishment of a reasonable threshold of which method(s) should or should not qualify as medium for the acquisition of knowledge of social phenomena as some scholars would have us believe. This is because Gonzalez does not merely advocate for pluralism of methods, but for methodological pragmatism and pluralism. His pluralism is inextricable from pragmatism. The study therefore recommends the method of complementarity as a necessary approach for the study of social reality as an interwoven plurality.

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THE CONCEPT OF *TECHNE* IN MARTIN HEIDEGGER'S PHILOSOPHY

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Abstract

The concept of *techne* holds a pivotal place in Martin Heidegger's philosophy, illuminating his critique of modern technology and its ontological implications. This paper explores Heidegger's nuanced understanding of *techne*, tracing its origins to ancient Greek thought, where it signified a mode of knowing and making intertwined with *poiesis*—the bringing-forth of truth. Heidegger distinguishes between traditional *techne* as a revealing practice and modern technology as an *enframing* force (Gestell), which challenges the essence of being by reducing the world to mere resources. By delving into key Heideggerian texts such as *The Question Concerning Technology*, *Being and Time*, this study elucidates how *techne*, in its primordial sense, offers a pathway to authentic existence and a more harmonious relationship with nature. The analysis underscores the relevance of Heidegger's insights in contemporary philosophical discourse, advocating for a re-evaluation of technological practices in light of their ontological foundations.

Keywords: *Techne*, Martin Heidegger, *enframing*

Introduction

The concept of *techne* is an important aspect of Heidegger's philosophy because it provides the basis for understanding his view of technology. Heidegger's concern in his analysis of technology originates from the ancient Greek term for arts and crafts – *techne*. However, merely defining *techne* as art or craft is oversimplifying the term and depriving it of its deeper meaning. Hence, understanding this deeper meaning is fundamental to the notion of technology. In line with his concern for our experience as beings-in-the-world, his exposition of the essence of technology through his book The Question Concerning Technology uncovers its impact and significance in human existential experience. In his eyes, this significance lies in the way technology shapes our relationship with the world and ultimately influences our understanding of ourselves as human beings (Heidegger, 1977). Heidegger's philosophy of technology challenges us to critically examine the role of technology in our lives and consider its implications for our existence.

Heidegger's philosophy offers a unique perspective on *techne*, transforming it from a mere means to an end into a mode of revealing and a form of truth. In ancient Greek thought, *techne* was understood as a form of knowledge and skill associated with making and doing. It was a way of bringing forth, akin to poiesis, and was deeply connected to the notion of revealing, or aletheia. However, Heidegger's interpretation differs significantly from this classical understanding of the term. For Heidegger, the essence of modern technology, which he terms Gestell (*enframing*), represents a challenging-forth that reduces the world to a standing reserve (Bestand) at humanity's disposal. The notion of bestand implies that modern technology is considered primarily as a means or instrument to human ends.

This paper aims to elucidate Heidegger's understanding of *techne*, by examining its meaning and underpinnings. By examining his ideas, especially in The Question Concerning Technology, this study will interpret Heidegger's thoughts on the transformation of *techne* in the modern age and its implications for human existence. This analysis will also delve into the implications of Heidegger's critique of modern technology on our understanding of authenticity and the essence of being. Through a hermeneutic approach, this paper seeks to uncover the deeper meanings behind Heidegger's exploration of *techne* and its impact on human existence in the world.

This research paper aims to illuminate Heidegger's philosophical perspective on technology as a revealing and fundamental aspect of human existence. Through this critical engagement with Heidegger's ideas, this study will contribute to ongoing discussions about the role of technology in shaping human existence and the challenges it poses to maintaining authenticity in the modern age.

The Ontology of *techne*

Martin Heidegger's work, Being and Time, serves as the cornerstone for understanding his inquiry into the nature of Being. Within this framework, Heidegger introduces the concept of Dasein (Heidegger, 2010), the being that questions its own existence and has the unique capacity to understand Being. It is through the lens of Dasein that Heidegger explores the concept of *techne*—a term for craftsmanship in ancient Greek thought which Heidegger reinterprets as a mode of revealing and a form of knowledge. He argues that technology is not just a means of revealing but also a way of bringing forth truth in the world. This bringing forth of truth is akin to allowing technology to reveal itself and determining itself in its essence.

In the pre-Socratic era, *techne* was seen as a way of bringing forth, a process that was intrinsically connected to aletheia, or the revealing of truth. Heidegger adopts this view but extends it to suggest that *techne*, as a form of poiesis (creation or bringing-forth), is a fundamental way in which Dasein reveals or uncovers the world (Heidegger, 2010). This disclosure, or uncovering, is not a mere manipulation of objects but an uncovering of the essence of what it means to be. Heidegger emphasises that *techne* is not just about producing objects but about revealing the deeper meaning of existence through our interactions with the world. Through *techne*, Dasein engages in a process of uncovering and understanding the essence of being-in-the-world. This process is essential for Dasein to fully affirm its own existence and place in the world.

Heidegger's analysis of equipment (Zeug) in Being and Time highlights how tools are not just instruments for use but reveal our relationship to the world and our own existence (Heidegger, 2010). Through this perspective, Heidegger emphasises the importance of understanding technology as a way of revealing truth and being-in-the-world. Heidegger's philosophy challenges the traditional view of technology as a mere means to an end, urging us to consider how our tools shape our understanding of reality. By examining the interconnectedness between humans and their tools, Heidegger prompts us to reflect on the impact of technology on our perception of the world and ourselves.

However, Heidegger cautions against the modern technological interpretation of *techne*, which he sees as a departure from its original essence. Modern technology, or Gestell (*enframing*), represents a mode of existence that challenges nature and transforms it into a standing reserve (Bestand) (Heidegger, 1977). This *enframing* obscures the true nature of *techne* as a revealing and instead imposes a calculative and utilitarian framework upon the world. Heidegger warns that this *enframing* mindset leads to a loss of connection with the world as it truly is, reducing everything to mere resources for human use. He calls for a return to a more authentic relationship with technology, one that allows for a deeper understanding and appreciation of our place within the world.

A Brief History of *techne*

The term *techne* is a complex Greek word with various meanings, but it is often translated as "art" or "craftsmanship. The ambiguity of its application in classical Greek philosophy illustrates how creativity, knowledge, and skill are all intertwined in the creative process. In ancient Greek thought, *techne* referred to the practical knowledge and skills required to create or produce something (Meagher, 1988). It encompassed a wide range of disciplines, including painting, sculpture, architecture, and even medicine, etc. Even though modern technology, which entails the application of scientific knowledge for practical purposes, may seem similar to *techne*, there is a subtle difference between the two. While technology focuses on the use of tools and machinery to achieve specific goals, *techne* also emphasises the mastery of techniques and the creative process involved in producing something. *techne* can be seen as a more holistic approach that values not only the result but also the skill and expertise required to achieve it.

The concept of *techne* in ancient Greek philosophy was rich and multifaceted, encompassing not only the skills of the craftsman but also the arts of the mind and the fine arts (Garrett, 1987). Ancient Greek philosophers like Plato and Aristotle considered *techne* as a form of knowledge that was practical yet also connected to the divine, as it was through *techne* that humans could mimic the creative acts of the gods (Gavrilov, 2021). Aristotle further developed the concept of *techne* in his works, particularly in Nicomachean ethics and metaphysics. For Aristotle, *techne* was a rational faculty exercised in making, guided by true reasoning.

However, for Heidegger, *techne* is both the activities and skills of craftsmanship but also the fine arts and other arts of the mind. *techne* implies "bringing forth," and he uses the Greek term poiesis to elaborate on this idea of *techne* (Heidegger, 1977). This poiesis is the root of the English word poetry and emphasises creation or emergence. This affinity of *techne* with poiesis, or bringing-forth, establishes *techne* as a creative enterprise that involves the making or creating of things with expertise. According to Heidegger, "it was not technology alone that bore the name *techne*. Once that revealing that brings forth truth into the splendor of radiant appearing also was called *techne*" (Heidegger, 1977).

In contrast with modern understanding, *techne* was not limited to the creation of machinery and tools. For Heidegger, it implies the revealing of truth and bringing it forth to our grasp. Heidegger's perspective on *techne* challenges the modern view of technology as solely mechanical or instrumental. He suggests that *techne* involves a deeper connection to truth and the essence of being and its relation to our experience and existence in the world.

The Question Concerning Technology

Heidegger describes *techne* as a way of bringing forth or uncovering the truth of reality, and this is where his idea of technology begins and differs from the ancient Greeks. For him, technology is not limited to machines or tools but all human activity that involves revealing or bringing forth truth. He argues that technology is not simply a means to an end but rather a way of understanding and interacting with the world. Heidegger asserts that "questioning builds a way," and taking cognisance of this way is an essential part of understanding the essence of technology (Heidegger, 1977). The way, according to Heidegger, is a way of thinking perceptibly that also influences language. The purpose of this questioning is to open our existence to the essence of technology. According to Heidegger, the essence of a thing is not only what it is but also the way it manifests itself (Heidegger, 1977).

Therefore, an apprehension of its essence enables us to experience the nature of technology in its true form. However, he argues that the concept of technology is not the same as the essence of technology. To prove this claim, he starts with an analysis of the term essence. Using the entity "tree" as an example, he says that what is common with all trees is not itself a tree that can be encountered, and this is the same for the notion of technology (Heidegger, 1977). This implies that the concept of technology is an abstract idea that cannot be directly encountered or experienced. Instead, it is the manifestation and application of technology in our daily lives that allows us to truly understand its essence. For Heidegger, examining how technology shapes and influences various aspects of society, can help us gain a deeper understanding of its true nature and significance (Heidegger, 1977).

Hence, the essence of technology, according to him, is not technological; therefore, we miss the mark if we ascribe the technological to technology. This simply implies that technological artefacts are not a representation of the essence of technology. Instead, Heidegger argues that the essence of technology lies in its ability to reveal and shape our understanding of the world. For him, technology is a means through which we interact with and interpret our surroundings, influencing our perception and relationship with reality (Heidegger, 1977).

He considers man enslaved to technology, even if we deny it, because we see it as something neutral, and this singular act blinds us to the real essence of technology. Following the thinking of ancient philosophers like Plato and Aristotle, the essence of an entity is seen as what the entity is, and when we ask the question concerning technology, we also ask what it is (Heidegger, 1977). To address this question, Heidegger considers two common responses to the question of the definition of technology. This first definition considers technology as a means to an end, and the second definition considers it a human activity. For Heidegger, these two ways of looking at technology belong together.

Heidegger's Interpretation of *techne* as Technology

Heidegger's interpretation of *techne* focuses on the essence of technology as a revealing process that is closely intertwined with human existence. He uses the term "*enframing*" or "Gestell" to describe how modern technology distorts our understanding of the world and ourselves, emphasising the danger of reducing everything to mere resources for efficiency. This concept highlights the importance of questioning the impact of technology on our way of being in the world. to refer to the way in which technology shapes our understanding of the world. However, along with *enframing*, he identifies another aspect of technology that he calls "poiesis," which refers to the creative and generative potential of technology. Poiesis (bringing forth) is opposed to *enframing*'s tendency to reduce things to their instrumental value (Heidegger, 1977).

Heidegger's concept of bringing-forth (poiesis) is rooted in revealing and encompasses four causes or modes of being. He argues that technology is not a means but a way of revealing, and by imbibing this thinking, the essence of technology can be understood. Heidegger believes that technology is not just a tool for achieving an end but a way to reveal the world to us, shaping our perception and experience of reality. Heidegger suggests that modern technology can reveal itself when we focus on its fundamental features. However, it poses a challenge to understanding the essence of technology, as it challenges nature. He uses the term challenging-forth to describe the revealing that comes from modern technology, but this type of revealing is inadequate (Heidegger, 1977).

Heidegger argues that man cannot master technology because it resists attempts to control it. This idea challenges the traditional understanding of man as the master of his environment and raises questions about the nature of human existence with technology (Heidegger, 1977). Heidegger suggests that the essence of technology must align with the essence of man as Dasein, who must be open to affirming the relationship between technology and man. To truly understand and engage with technology, man must acknowledge and affirm his essence as Dasein, recognising that his being is intertwined with the essence of technology itself (Heidegger, 1977).

Heidegger views technology as a mode of revealing and not merely a means to an end. He introduces the concept of *enframing* to explain how technology shapes our conception of Being and reality. He rejects the idea that man can master technology and sees it as a way of 'bringing-forth', altering our relationship with the world. He is concerned about technology's distortion of reality, which reduces the world to quantifiable structures and descriptions without authenticity. He calls for a modification of our engagement with technology, encouraging a deeper reflection on how it affects our conception of reality. He argues that the norms ascribed to technology and the need for adjustment are crucial in understanding our relationship with technology and human beings.

Heidegger's concept of instrumentality focuses on the revealing nature of technology, which he sees as a way of revealing rather than a means to achieve an end. He argues that technology is not just a tool but a way of revealing the world to us. Heidegger's understanding of technology comes from its Greek origin, which refers to craftsmanship and fine arts. Heidegger suggests that modern technology can reveal itself when we focus on its fundamental features. However, it poses a challenge to understanding the essence of technology, as it challenges nature.

Recommendations

Based on the analysis of Heidegger's concept of *techne*, the following recommendations are proposed to address the challenges posed by modern technology and to realign technological practices with more authentic modes of existence:

1. Encourage Critical Reflection on Technology: Individuals and institutions should engage in critical reflection on the role of technology in shaping human existence. This can involve educational programs and public discussions that explore the ontological implications of technological advancements.

2. Promote Ethical and Sustainable Technological Practices: Stakeholders in technology development should integrate ethical considerations and sustainability into the design and deployment of technological systems. This includes prioritizing practices that foster a harmonious relationship with nature rather than reducing it to mere resources.

3. Foster a Return to Authentic Modes of Revealing: Modern societies should revisit traditional crafts and practices that align with Heidegger's notion of poiesis. These practices emphasize creativity, skill, and a deeper connection to truth.

4. Encourage Interdisciplinary Dialogue: Philosophers, technologists, environmentalists, and policymakers should collaborate to explore the intersection of technology, ethics, and ontology. Such dialogue can provide a comprehensive framework for addressing the challenges posed by *enframing*.

5. Develop Technological Awareness in Design: Engineers and designers should be encouraged to create tools and systems that facilitate revealing rather than obscuring the essence of being. This involves designing technology that respects the integrity of the natural

world and human existence.

Conclusion

Martin Heidegger considers *techne* as a way the truth of reality is revealed to us; its purpose is to grant us access to reality by unconcealing its essence. This bold assertion is the basis for his view of technology and its implications for humanity. However, instead of revealing or “bringing forth,” as he puts it, technology has estranged us from being. Heidegger wants us to “let being be,” but instead modern technology has become a “standing reserve," reflecting our emphasis on the instrumental nature of technology. This standing reserve mentality reduces everything, including nature and human beings, to mere resources to be exploited for efficiency and productivity. Heidegger warns that this mindset ultimately leads to a loss of our connection with the essence of being and the world around us.

His emphasis on the need for a more holistic understanding of technology, one that considers its ethical and ecological dimensions, urges us to transcend the narrow perspective of technology as a means to economic ends. By recognising technology as a powerful force that shapes our lives and environments, Heidegger urges us to reevaluate our relationship with it and strive for a more harmonious coexistence. This broader perspective encourages us to prioritise the long-term well-being of both humanity and the Earth rather than solely focusing on short-term gains. Heidegger's philosophy challenges us to reflect on the impact of technology on our existence and take responsibility for ensuring a more balanced and ethical relationship with it.

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TIME SERIES ANALYSIS OF BLACK CARBON AND RAINFALL PATTERN IN SOME SELECTED STATES IN THE GUINEA SAVANNAH REGION OF NIGERIA

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ABSTRACT

Time series analysis of black carbon and rainfall patterns in some selected states in the Guinea Savannah region of Nigeria was assessed in this study over 40 years (1983 – 2023) using Satellite-derived datasets and images depicting the frequency, intensity, and concentration of black carbon in the region were produced and examined through remote sensing techniques utilizing Earth data resources from the NASA GESDISC data repository accessed via the NASA Giovanni platform. Trend analysis on black carbon and rainfall data from five (5) states (Oyo, Kaduna, Enugu, Benue, and Taraba states) was done using Microsoft Excel software. The lowest level of Black carbon concentration (0.65 µg/m3) in Benue State was observed in 1996. High concentrations of Black carbon (1.09 µg/m3) were observed in 1995, followed by 1.13 µg/m3 in 1990. The lowest amounts of rainfall (1070.63 mm) in Benue state was observed in 2023. A lower amount of rainfall (1619.84 mm) was observed in 2023. The lowest level of Black carbon concentration (0.52 µg/m3) in Bauchi was observed in 1983. High levels of Black carbon concentration (1.07 µg/m3) in Kaduna were observed in 2000 which the lowest amount of rainfall 940.71 mm was observed in 2021. The lowest amount of rainfall (860.34 mm) in Oyo State was observed in 2001. The data presented in

this study will be crucial in influencing climate change mitigation strategies, enhancing climate resilience, and shaping policy frameworks in Nigeria.

KEYWORDS: Time series, rainfall pattern, black carbon, Guinea savanna, Nigeria

INTRODUCTION

Time series analysis of rainfall and black carbon in the Guinea savannah is very crucial to every nation because it aids in understanding climate patterns (Ayanlade, 2009). Rainfall patterns in the Guinea savannah are critical for agriculture, water resource management, and overall ecosystem health (Ayanlade and Ojebisi, 2020). Time series analysis helps in identifying trends, cycles, and anomalies in rainfall data over years or decades (Tularam and Mahbub, 2010). This understanding is essential for predicting future climate scenarios and adapting agricultural practices accordingly. In addition, agriculture in the Guinea savannah heavily relies on rainfall. Time series analysis can reveal long-term trends in rainfall patterns (such as increasing or decreasing trends, seasonal variations, and extreme events like droughts or floods). This information is vital for farmers and policymakers to develop strategies for drought preparedness, water management, and crop selection (El Solh and van Ginkel, 2014).

Furthermore, black carbon (BC) is a significant air pollutant emitted from incomplete combustion processes. It has implications for both climate change (as a potent contributor to global warming) and human health (due to respiratory problems). Time series analysis can track BC concentrations over time, helping to understand seasonal variations, sources of emissions, and the effectiveness of pollution control measures (Salcedo *et al*., 1999). More so, governments and environmental agencies can use time series analysis results to formulate evidence-based policies and regulations.

For instance, understanding the relationship between rainfall patterns and agricultural productivity can guide policies on water management, irrigation systems, and crop insurance schemes (Olayide *et al*., 2016). There is limited information on the time series analysis of rainfall patterns and black carbon concentration in the Guinea belt of the country. The time series analysis of black carbon and rainfall patterns in some selected states in the Guinea Savannah region of Nigeria was therefore assessed in this study.

MATERIALS AND METHODS

Study Location

The research area under consideration is the Guinea Savanna Zone, Nigeria (GSZN), situated within longitudes 4o –10oE and latitudes 6o – 11o301N (Figure 1). To the north, it is adjacent to the Sudano–Sahelian Zone, Nigeria (SSZN), while to the south, it borders the Rain Forest, Nigeria (RFN). Positioned centrally within the country, the Guinea Savannah stands out as the most extensive ecological region in Nigeria, encompassing almost fifty percent of the nation. The Guinea savanna region represents the largest expanse within the West African savanna. This particular zone constitutes the predominant portion of the savannah area and is occasionally categorized into the Southern Guinea Savannah which includes states such as Kwara, Benue, Enugu, Ebonyi, Oyo, Ekiti, Osun, and the Northern Guinea Savannah which encompasses states like Niger, Taraba, Kaduna, Bauchi, Kano, Adamawa, Benue, Kwara, Kogi, among others.

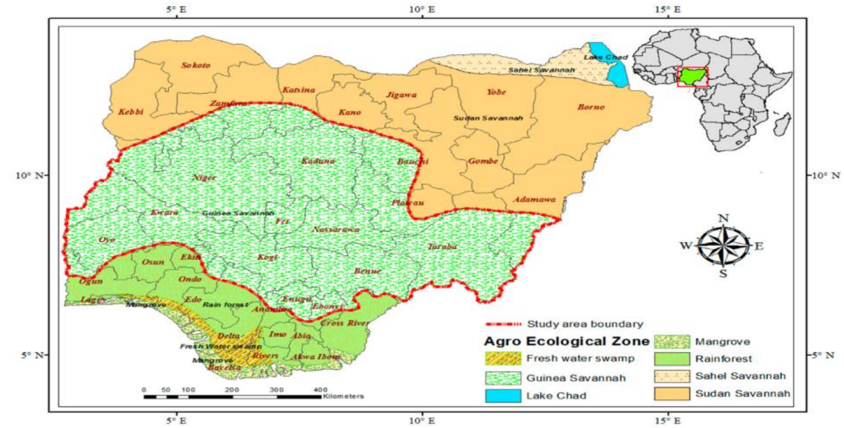

Figure 1. The Agro-ecological zones of Nigeria - Guinea Savannah

(Source: Field Work).

Sample and sampling technique

Data sets and images derived from satellites showing rainfall characteristics, frequency, intensity, and Black carbon levels in the specified region were acquired through remote sensing techniques utilizing data sources from the NASA GESDISC data archive accessed via the Nasa Giovanni platform. The geographical layout of the Guinea Savannah region in Nigeria was procured with the assistance of Google Earth, and specific maps of the five states of interest were extracted as shape files. Through the utilization of Earth Data satellite sources, satellite signals indicating rainfall patterns and Carbon remnants were obtained by initiating the NASA Giovanni platform and examining satellite images originating from satellites such as Modern-Era Retrospective Analysis for Research and Applications - 2 (MERRA - 2), Atmospheric Infrared Sounder (AIRS), Moderate Resolution Imaging Spectroradiometer (MODIS - Aqua and MODIS - Terra), and Ozone Monitoring Instrument (OMI) onboard NASA's Aura satellite. Data sets representing the selected five states within the Guinea-savannah region of Nigeria were retrieved. Additionally, Time Average Maps and Time series Average Area were graphed for analysis purposes.

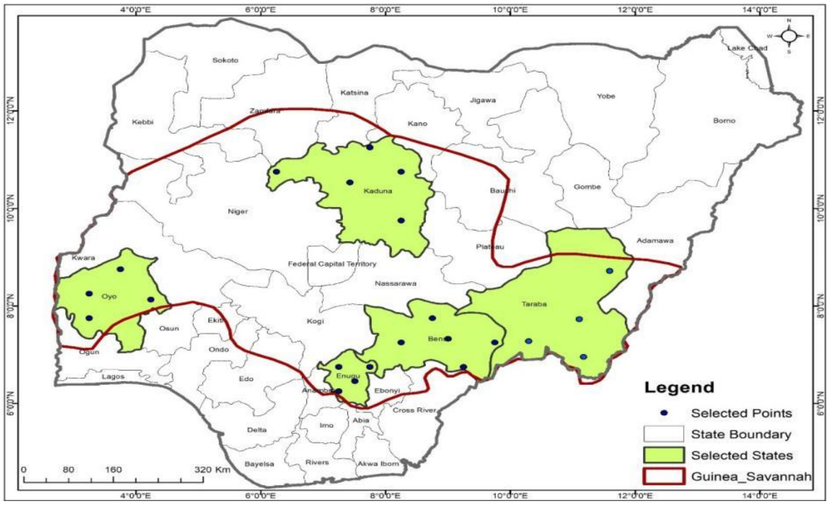

Figure 3.2. The Guinea Savannah and the 5 selected states in each geopolitical zone (Source: Field Work).

Table 1. Coordinates of 5 selected states in each geopolitical zone of the Guinea Savannah

States	**Oyo**	**Kaduna**	**Enugu**	**Benue**	**Taraba**
Longitude	4.237276	7.428579	7.507991	9.000531	7.668983
Latitude	8.131337	10.52936	6.458064	7.327793	11.040769

Underpinning Theory of Black Carbon and Rainfall

The trend analysis provides insight into the relationship between black carbon emissions and rainfall patterns. One of the theories that connect black carbon and rainfall is the theory of black carbon modified rainfall variability hypothesis (BCMRVH). This theory shows that tiny particles called black carbon affect rainfall patterns. Although, it recognised that the process is a complex one that begins at the burning of biomass, fossil fuel and activities that releases particles into the atmosphere which absorb sunlight and thereby causing warming in the atmosphere(Ramanathan *et al*., 2007; Bond *et al*., 2013). The warming changes cloud formation and precipitation ,leading to altered rainfall pattern (Rosenfeld *et al*., 2008). Another theory is the Aerosol-Cloud Rainfall Interactions (ACRI). This processes also shows how aerosols influence cloud properties, precipitation and rainfall pattern. Here aerosols act as cloud condensation nuclei (CCN), modifies the cloud droplet size which result to precipitation efficiency ,intensity and type of rainfall (Ramanathan *et al* 2001).

Statistical Analysis

Rainfall and Black carbon generated were used for the Time Series Analysis using Microsoft Excel.

RESULTS

Figure 1 shows the variation of Black carbon concentration for Benue state (1983 - 2023). The lowest level of Black carbon concentration (0.65 $\mu g/m^3$) was observed in 1996, followed by 0.78 $\mu g/m^3$ in 1983, 0.83 $\mu g/m^3$ in 1994, and 0.84 $\mu g/m^3$ respectively in 1986 and 1988. High concentrations of Black carbon (1.09 $\mu g/m^3$) were observed in 1995, followed by 1.13 $\mu g/m^3$ in 1990, slightly high concentrations (1.42 $\mu g/m^3$) observed in 1998, with the highest concentration of Black carbon (1.56 $\mu g/m^3$) in 2005, where it slightly decreased to (1.28 $\mu g/m^3$) in 2008, followed by a slight depression (0.99 $\mu g/m^3$) in 2015, thereafter it peaked (1.19 $\mu g/m^3$) in 2017, followed by a slight decrease (0.93 $\mu g/m^3$) in 2023. Figure 2 shows the Time Series of Rainfall for Benue State (1983 - 2023). The lowest amount of rainfall (1070.63 mm) was observed in 2023, closely followed by 1163.25 mm in 2021, 1165.54 mm in 2013, 1262.26 mm in 2017, 1276.58 mm in 2015, 1329.47 mm in 1988, 1349.20 mm in 1992 and 1459.89 mm in 2011. The highest amount of rainfall (1894.93 mm) was observed in 2016, with higher levels of rainfall observed 1887.45

mm in 1997, 1804.70 mm in 2002, 1680.34 mm in 1990, 1676.09 mm in 2020, with elevated amounts of rainfall (1818.94 mm) in 2009 and 1822.75 mm in 2012.

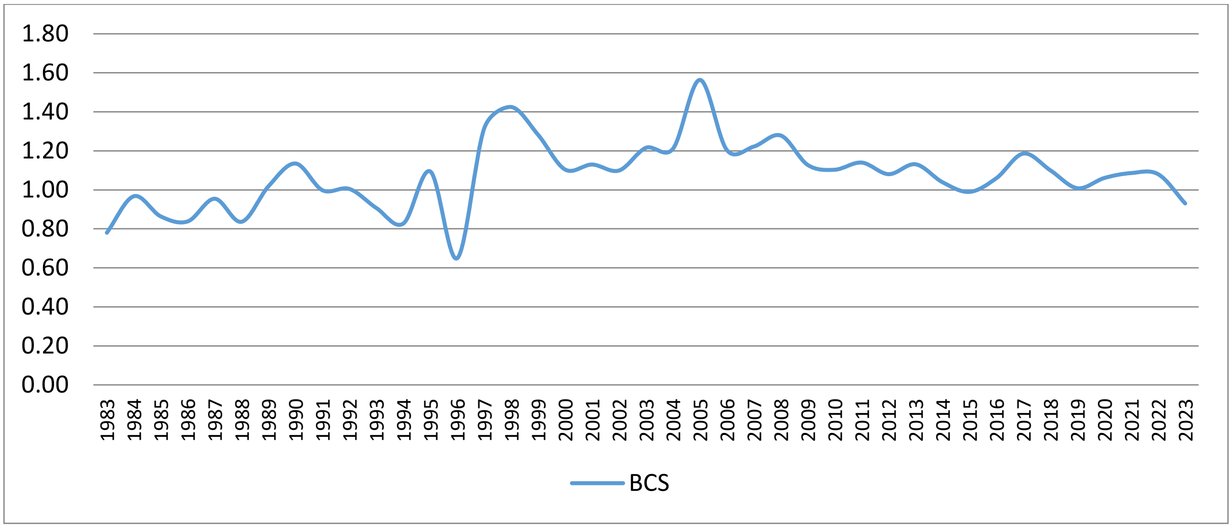

Figure 1: Time Series of black carbon for Benue State (1983 - 2023)

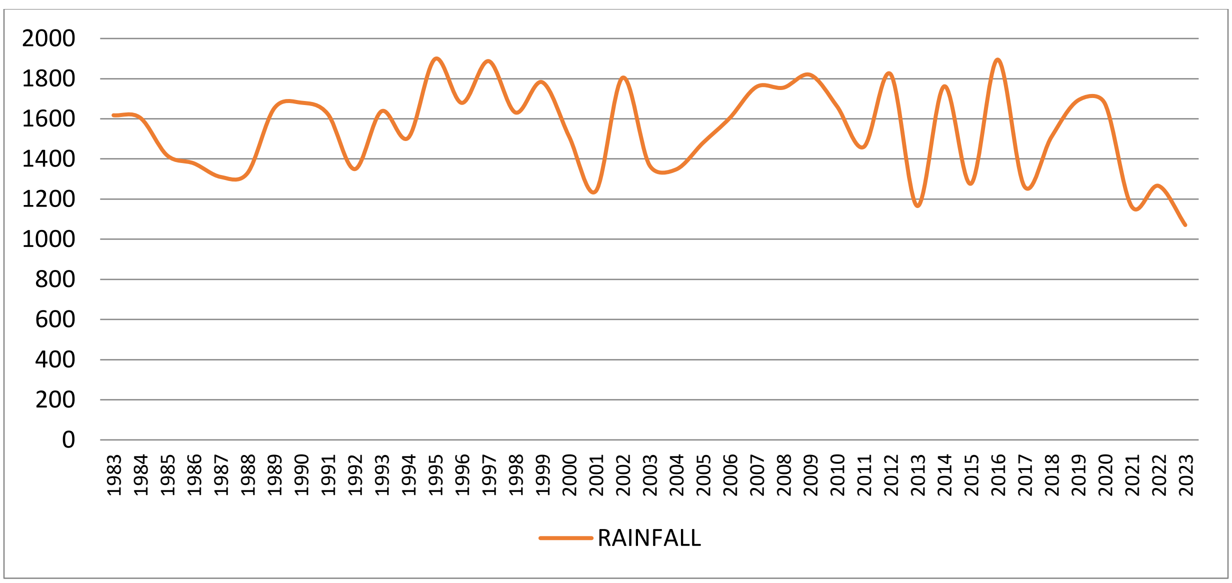

Figure 2: Time Series of Rainfall for Benue State (1983 - 2023)

Figure 3 shows the variation of Black carbon concentration for Enugu state (1983 - 2023). Lower levels of Black carbon concentration (1.94 μg/m^3) were observed in 2002, followed by (1.83

μg/m^3) in 2023, (1.84 μg/m^3) in 2015, (1.35 μg/m^3) in 1996, (1.29 μg/m^3) respectively in 1993 and 1989, followed by (1.23 μg/m^3) in 1986 and the lowest level of Black carbon concentration (1.05 μg/m^3) was observed in 1983. High levels of Black carbon concentration (2.04 μg/m^3) were observed in 2021, (2.10 μg/m^3) in 2017, (2.15 μg/m^3) was observed in 1999, followed by (2.30 μg/m^3) in 2008, and the highest level of Black carbon concentration (2.32 μg/m^3) was observed in 2005.

Figure 4 shows the Time Series of Rainfall for Enugu State (1983 - 2023). Lower amount of rainfall (1619.84 mm) was observed in 2023, followed by 1666.22 mm in 1986, 1634.33 mm in 2001, 1694.11 mm in 1992, followed by 1469.53 mm in 2013, 1415.18 mm in 2015 and the lowest amount of rainfall 1381.31 mm was observed in 2002. Elevated amount of rainfall 1998.08 mm was observed in 2016. This is closely followed by 2150.51 mm in 1991, 2218.06 mm in 2006, 2236.93 mm in 2018, and 2379.31 mm in 1995, and the highest amount of rainfall (2388.43 mm) was observed in 1997.

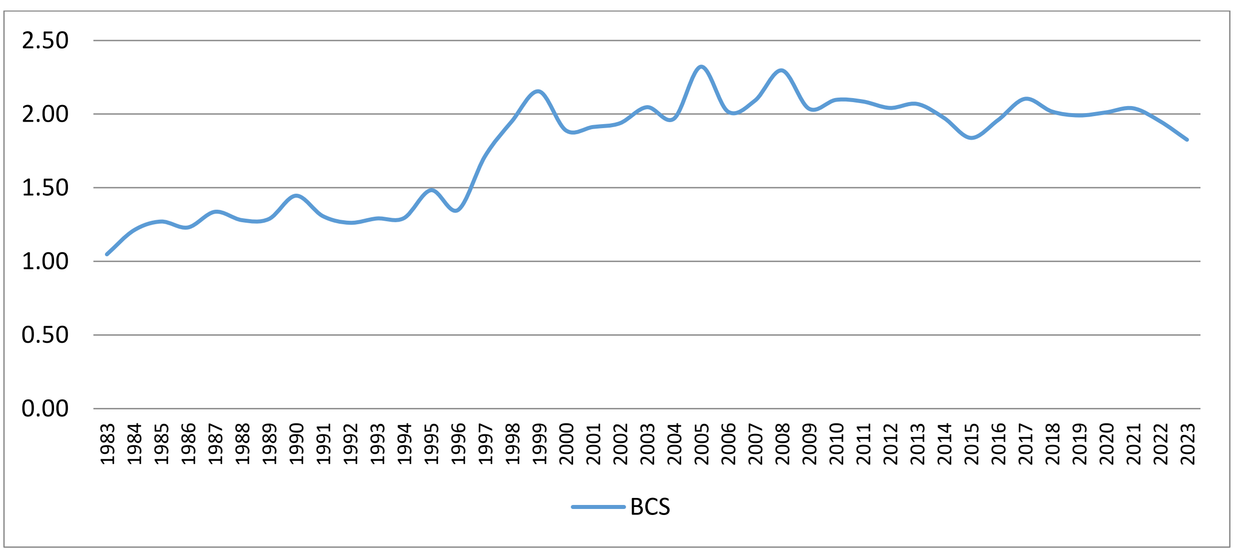

Figure 3. Time Series of black carbon for Enugu State (1983 - 2023)

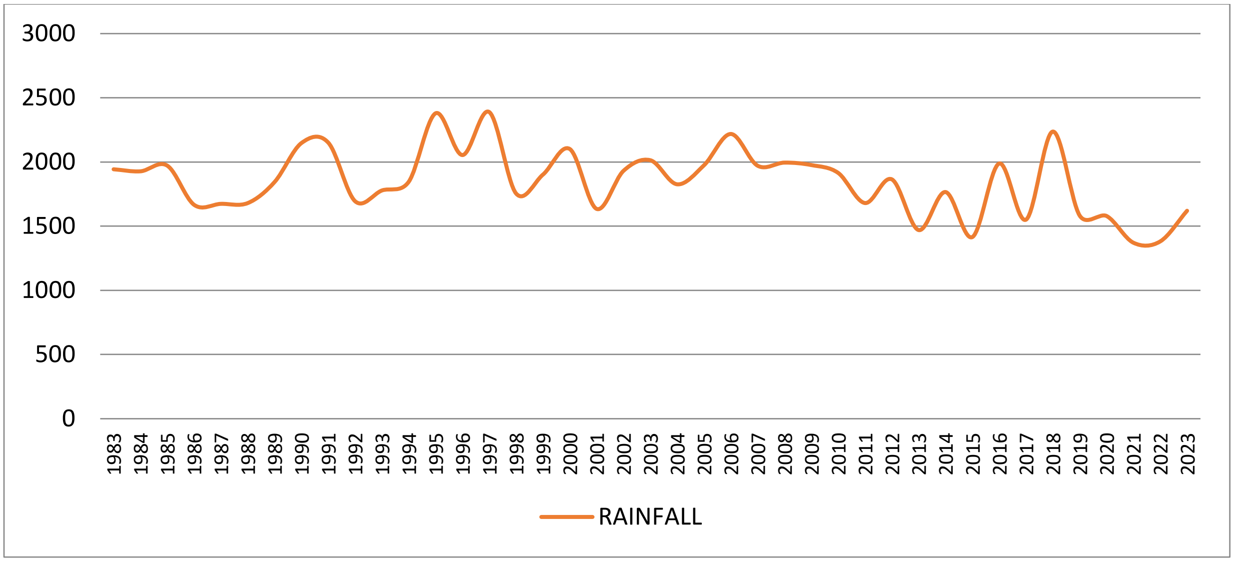

Figure 4 Time Series of Rainfall for Enugu State (1983 - 2023)

Figure 5 shows the variation of Rainfall and Black carbon concentration for Bauchi state (1983 - 2023). The lowest level of Black carbon concentration (0.52 µg/m^3) was observed in 1983, followed by 0.58 µg/m^3 in 1987, 0.59 µg/m^3 in 1989 and 0.65 µg/m^3 in 1993. The highest level of Black carbon concentration (0.88 µg/m^3) was observed in 2017, this is closely followed by 0.87 µg/m^3 in 2017 and 2007 respectively, elevated levels of Black carbon concentration (0.86 µg/m^3) were observed in 2023, (0.81 µg/m^3) and in 2005, (0.72 µg/m^3) in 1995 and 0.67 µg/m^3 in 1990.

Figure 6 shows the time Series of Rainfall for Taraba State (1983 - 2023). The lowest amount of rainfall (865.31 mm) was observed in 2015, followed by 899.57 mm in 1995, 894.20 mm in 2004, 904.84 mm in 2021, 947.52 mm in 2011, 968.55 mm in 2008, 1033.14 mm in 1997 and 1094.63 mm in 2000. The highest amount of rainfall (1456.73 mm) was observed in 2010. This is followed by 1330.93 mm in 1999, 1324.49 mm in 1996, 1219.61 mm in 1994, 1213.18 mm in 1992, 1127.30 mm in 1988, and 1073.93 mm in 1986.

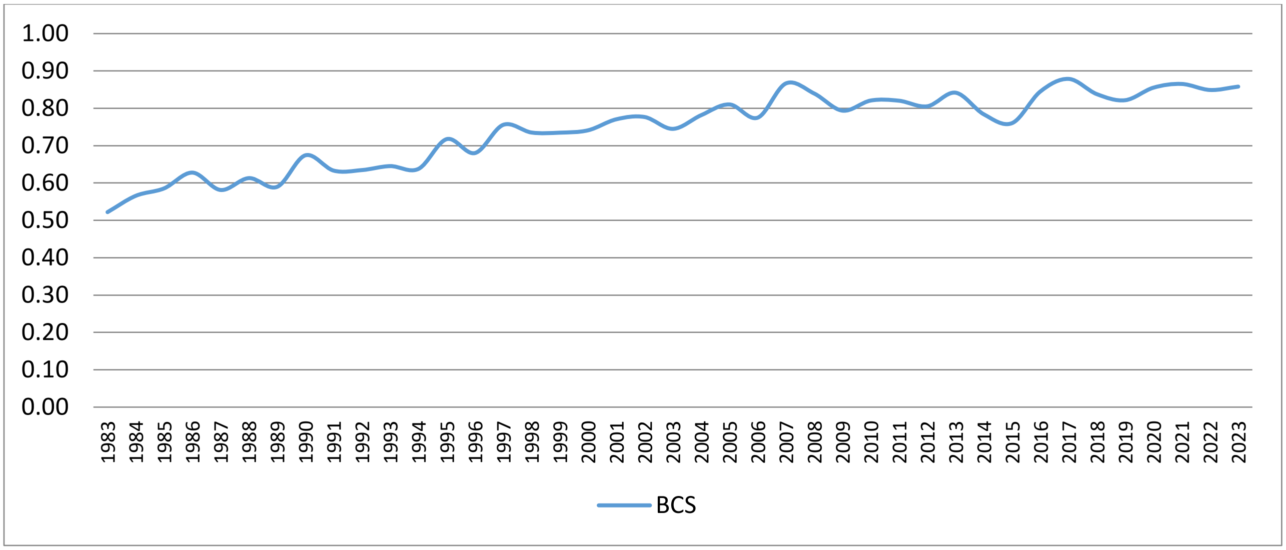

Figure 5: **Time Series of black carbon for Taraba State (1983 - 2023)**

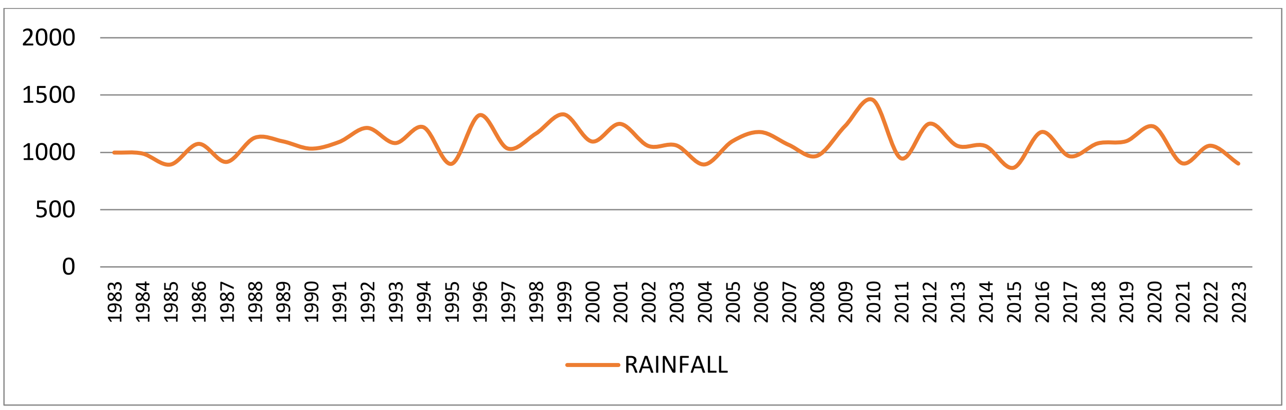

Figure 6: **Time series of rainfall and black carbon for Taraba State (1983 - 2023)**

Figure 7 shows the variation in Black carbon concentration for Kaduna state (1983 - 2023). The lowest Black carbon concentration (0.71 $\mu g/m^3$) was observed in 1983, where it gradually increased to 0.82 $\mu g/m^3$ in 1989, closely followed by 0.86 $\mu g/m^3$ in 1994. High levels of Black carbon concentration (1.07 $\mu g/m^3$) were observed in 2000, 1.21 $\mu g/m^3$ in 2006, 1.17 $\mu g/m^3$ in 2009, 1.18 $\mu g/m^3$ in 2015, 1.25 $\mu g/m^3$ in 2023, 1.29 $\mu g/m^3$ in 2017 and the highest level of Black carbon concentration (1.31 $\mu g/m^3$) was observed in 2007.

Figure 8 shows the Time Series of Rainfall and black carbon for Kaduna State (1983 - 2023). The lowest amount of rainfall 940.71 mm was observed in 2021, followed by 1003.24 mm in 2015, 1090.68 mm in 2008, 1127.36 mm in 2005, 1165.28 mm in 1987, elevated amount of rainfall (1228.50 mm) was observed in 1985, 1318.98 mm in 1994, 1580.27 mm in 1997, with the highest amount of rainfall of 1592.23 mm observed in 2003.

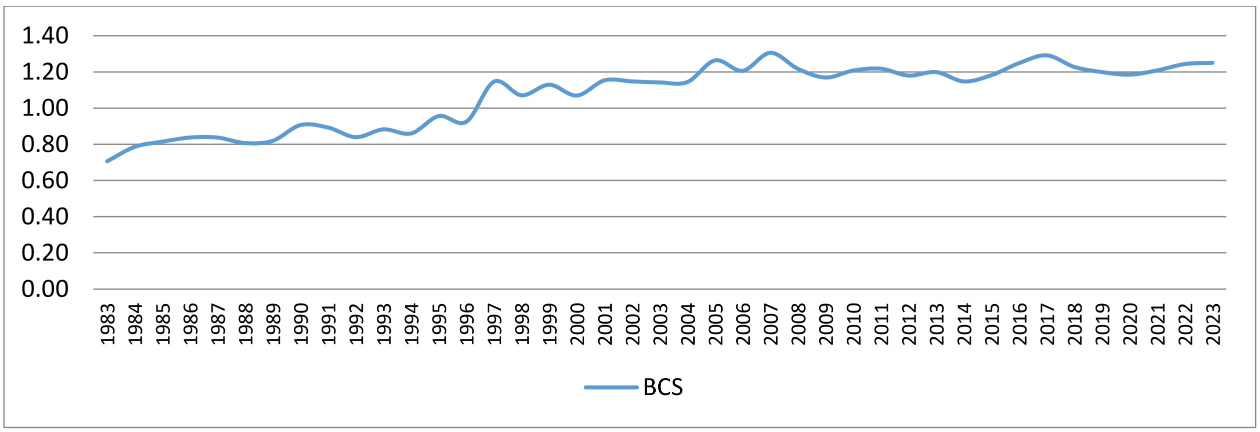

Figure 7: Time series of black carbon for Kaduna State (1983 - 2023)

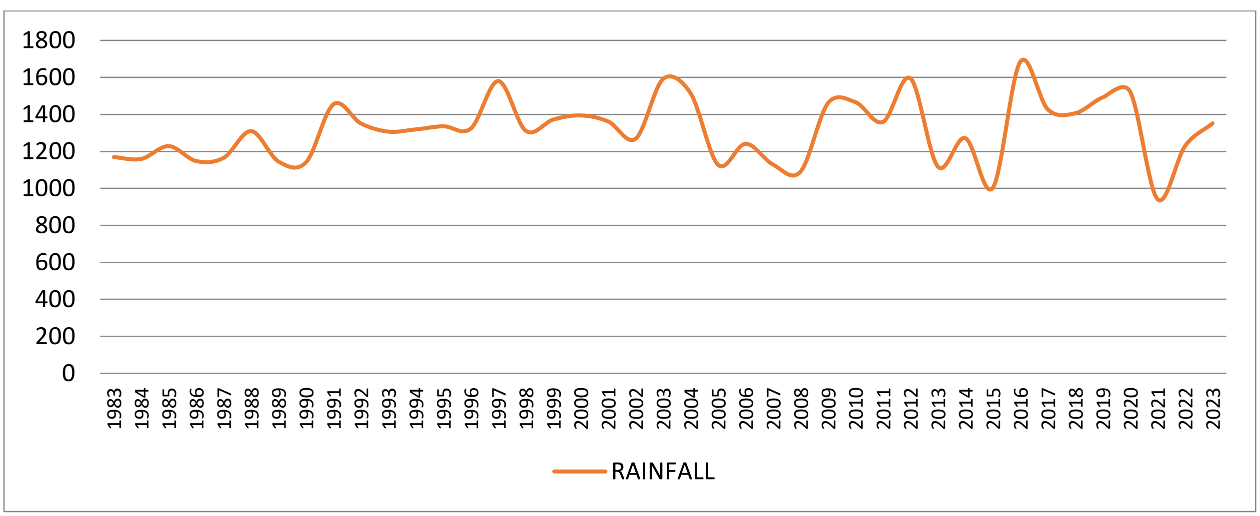

Figure 8: Time series of rainfall and black carbon for Kaduna State (1983 - 2023)

Figure 9 shows the variation of Rainfall and Black carbon concentration for Kaduna state (1983 - 2023). The lowest Black carbon concentration (0.75 μg/m^3) was observed in 1983, low levels of Black carbon concentration (0.89 μg/m^3) were observed in 1996, followed by 0.94 μg/m^3 in 1985, 0.92 μg/m^3 in 1994, elevated levels of Black carbon concentration (1.08 μg/m^3) was observed in 1990, 1.10 μg/m^3 in 1995, 1.39 μg/m^3 in 2015, 1.48 μg/m^3 in 2002, 1.50 μg/m^3 in 1998, slightly higher levels of Black carbon concentration (1.60 μg/m^3) was observed in 2013, 1.81 μg/m^3 in 2007, and the highest Black carbon concentration (1.85 μg/m^3) was observed in 2005.

Figure 10 shows a Time Series Analysis of Rainfall and black carbon for Oyo State (1983 - 2023). The lowest amount of rainfall (860.34 mm) was observed in 2001, low levels of Black carbon concentration (994.01 mm) were observed in 2013, followed by 1002.46 mm in 1989, 1081.88 mm in 1992, 1362.27 mm in 2007, a high amount of rainfall 1516.98 mm was observed in 1995, followed by 1531.04 mm in 1991, 1557.46 mm in 2023, 1600.00 mm in 2008 and the highest amount of rainfall 1763.91 mm was observed in 2019.

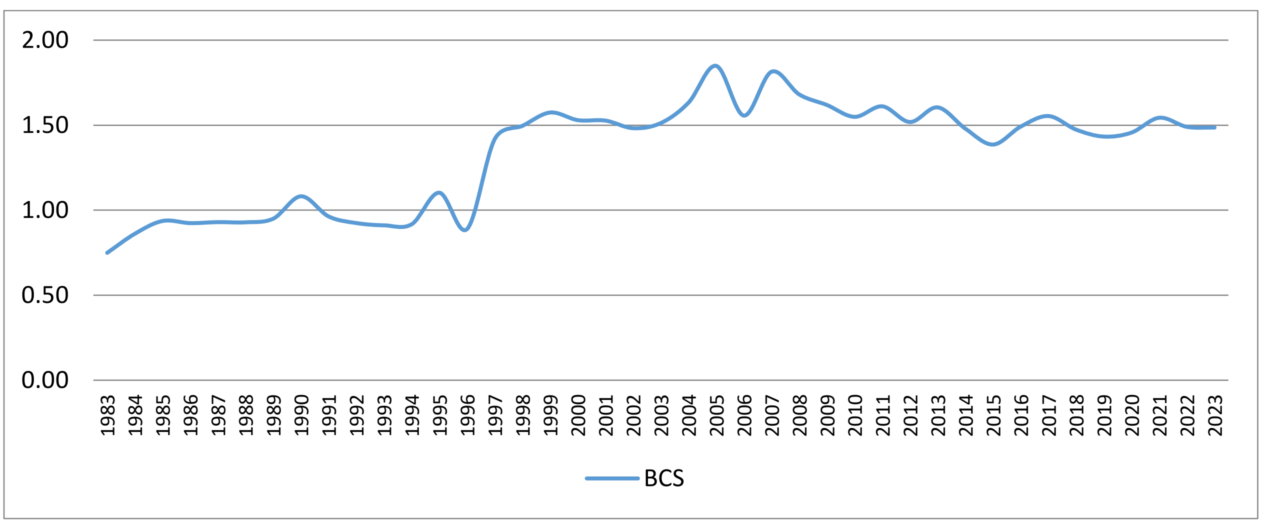

Figure 9: Time series of rainfall and black carbon for Oyo State (1983 - 2023)

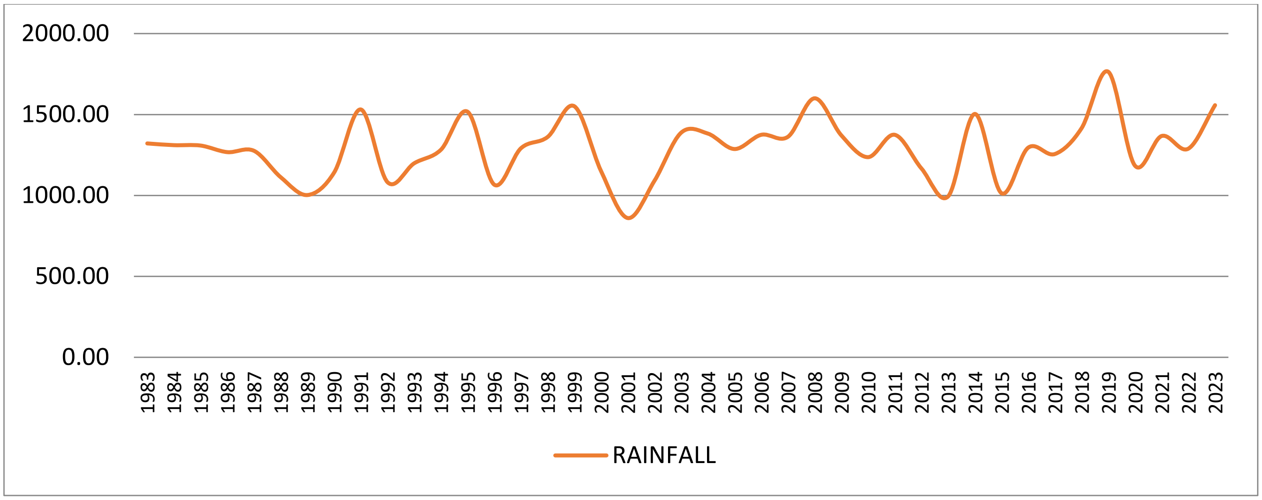

Figure 10: Time series of rainfall and black carbon for Oyo State (1983 - 2023)

Discussion

The fluctuation in annual rainfall patterns and the variability of black carbon levels may stem from various causes. Nevertheless, a correlation between the two has been established. According to Sand *et al*. (2020), black carbon can impact precipitation through diverse mechanisms, and the climate's response to black carbon presence heavily relies on its vertical dispersion. Essential climatic factors such as rainfall, temperature, relative humidity, and sunshine duration display fluctuations both in time and space, as observed by Zaman *et al*. (2013). Hence, climate variability refers to the changes in statistical parameters like mean values, standard deviations, frequency of extreme events, etc., across various temporal and spatial dimensions, as emphasized by Olabode and Adeleke (2017). Comprehending the intricate interplay among these elements is vital for forecasting and addressing alterations in rainfall patterns and their consequences on ecosystems, agriculture, water reserves, and human communities (Abbass *et al*., 2022). Changes in rainfall patterns and temperature variations can impact the growth of vegetation and subsequent biomass combustion. Arid conditions might result in more extensive wildfires and higher concentrations of black carbon (Allen *et al*., 2024).

Short-term fluctuations in precipitation patterns are predominantly influenced by localized weather phenomena like thunderstorms, cyclones, and frontal boundaries. These phenomena are notably erratic and can lead to unpredictable rainfall patterns within relatively confined geographical regions (Cheung *et al*., 2008). Additionally, seasonal variations are commonly observed in BC concentrations (Chen *et al*., 2022). For example, areas where solid fuels (e.g., wood, coal) are commonly used for residential heating tend to experience higher BC concentrations during the winter months when heating demand peaks. Moreover, activities such as biomass burning for land clearing contribute to elevated BC levels during specific seasons. Variations in industrial operations, production processes, and technologies can also impact BC concentrations in neighboring areas (Li *et al*., 2021).

The concentration of BC is significantly influenced by the intensity and nature of combustion sources within a particular region (Chen *et al*., 2022). These variations may arise from natural internal mechanisms, external factors, or continual anthropogenic modifications in atmospheric composition and land utilization practices, as highlighted by Abaje *et al*. (2010). These results are in line with the conclusions reached by Alawaye and Alao (2017) who conducted a statistical analysis of rainfall patterns to establish a suitable model based on time series data related to monthly rainfall distribution in Osogbo Metropolis. Their study unveiled a considerable degree of volatility in the rainfall data marked by seasonal and irregular changes. Furthermore, Okorie (2015) documented that each rainy season in Nigeria is accompanied by tropical storms leading to substantial loss of life and property worth millions of naira nationwide. These situations underscore the critical necessity of investigating rainfall variability for purposes such as agricultural and water resource management, flood risk evaluation, climate change impact analysis, and other environmental assessments, as stressed by Kumbuyo *et al*. (2014).

In conclusion, the data presented in this study will be crucial in influencing climate change mitigation strategies, enhancing climate resilience, and shaping policy frameworks in Nigeria. Based on the trend analysis of black carbon and rainfall variability in some selected states in the guinea savannah of Nigeria, here are some recommendations;

1. There should be inform policies to reduce black carbon emissions by encouraging sustainable agricultural practices, reduce biomass burning in the region and thereby promoting clean energy
2. Educate farmers on climate-resilient practices by cultivating crops that can tolerate the changing pattern of rainfall
3. Develop early warning systems that can predict extreme rainfall events and droughts, enabling timely interventions
4. Enhancing monitoring networks by establishing more ground -based stations and utilize satellite data to monitor black carbon emissions and rainfall pattern.

This research has contributed the following to knowledge:

1. Characterizes black carbon emissions in the guinea savannah
2. Documents rainfall variability trends in the guinea savannah belt of Nigeria
3. Provides baseline data for future climate change studies

Suggestions for further studies:

Here are some suggestions for further studies

1. Quantify black carbon emissions from biomass burning and anthropogenic sources
2. Analyze the impact of black carbon on rainfall extremes (e.g., drought, floods

3. Explore the relationship between black carbon and other climatic variables (e.g., temperature, humidity)

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Quantification of the Influence of Cloud on Diurnal (Day and Night) Urban Heat Island Across Climatic Belts in Nigeria

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Abstract:

The study quantified the influence of clouds on diurnal (day and night) urban heat islands across climatic belts in Nigeria from 2003 to 2022. Remote sensing techniques were utilized to collect data such as Land Surface Temperature, GPS ground truth points, MODIS & Landsat images, and cloud cover data from CRU-TS spanning 20 years. The study covered urban and rural areas in Nigeria, with a sample size of 160 points distributed across eight cities. Statistical analysis, performed through SPSS, showed significant impacts of cloud cover variations on UHI dynamics ($F = 7.837$, $p = 0.012$). Diurnal UHI exhibited a significant difference ($H = 59.15$, $P=.001$). Urban expansion was identified as exacerbating UHI effects, emphasizing the urgency of sustainable urban planning strategies. The study reiterated the necessity of tailored mitigation plans, considering diverse UHI patterns across cities and climatic zones. Therefore, the study advocates evidence-based urban planning for UHI mitigation and climate resilience. Recommendations include prioritizing green infrastructure and integrating cloud cover and wind speed variations into urban planning strategies.

Keywords: Urban-Heat-Island, Cloud and Climatic-belts.

1. Introduction

Urbanization in Nigeria has spurred the emergence of the urban heat island (UHI) effect, characterized by heightened temperatures in urban areas compared to their rural surroundings (Bassett et al., 2020). This phenomenon presents multifaceted challenges, including impacts on human health, energy consumption, and environmental sustainability (Ayuk & Njomgang, 2022). Despite the recognition of various drivers of UHI intensity, such as land cover changes and anthropogenic heat emissions, the specific influence of cloud cover on diurnal variations of UHI across different climatic belts in Nigeria remains insufficiently understood. This knowledge gap poses a significant barrier to the development of targeted mitigation strategies aimed at alleviating the adverse effects of UHI on urban residents and ecosystems (Wang et al., 2021). Globally, cloud cover has been identified as a critical modulator of surface temperatures in urban environments, with its role in attenuating or amplifying UHI effects depending on factors such as cloud type, coverage, and temporal variation (Theeuwes et al., 2019). Nigeria's diverse climatic zones, ranging from tropical rainforests in the south to arid conditions in the north, present unique atmospheric dynamics and cloud cover patterns that can influence the intensity and temporal variation of UHI (Areola & Fasona, 2018). Integrating remote sensing techniques, Geographic Information Systems (GIS) analysis, and climatic data offers promising avenues for quantifying the relationship between cloud cover and diurnal UHI variations across climatic belts in Nigeria (Amanollahi et al., 2016). Understanding these complex interactions is crucial for informing evidence-based urban planning decisions, climate adaptation strategies, and public health interventions aimed at mitigating the adverse effects of UHI in Nigeria and other tropical regions facing similar challenges associated with rapid urbanization and climate change.

2. Materials and Methods

2.1 Study Area

The study focuses on Nigeria, a country located in West Africa, bordered by Benin to the west, Niger to the north, Chad to the northeast, and Cameroon to the east. To the south, it is bordered by the Gulf of Guinea, providing access to the Atlantic Ocean. Nigeria's geographic coordinates range from approximately 4° to 14° North latitude and 3° to 15° East longitude, spanning a total area of around 923,768 square kilometers (Folorunso, 2021). The country encompasses diverse climatic zones, including tropical rainforests in the south, savannas and woodlands in the central regions, and arid and semi-arid conditions in the north, influenced by the West African monsoon system and the intertropical convergence zone (ITCZ) (Vallet-Coulomb et al., 2020). This geographic and climatic diversity makes Nigeria an ideal location for studying the influence of cloud cover on diurnal variations of the urban heat island phenomenon across different climatic belts. The study focuses on eight (8) major urban areas across different climatic belts i.e Tropical Wet Climate (Lagos & Port Harcourt), Tropical Savanna (Abuja & Enugu), Hot Semi Arid (Kano, Kastina & Maiduguri) and Montane (Jos) in Nigeria.

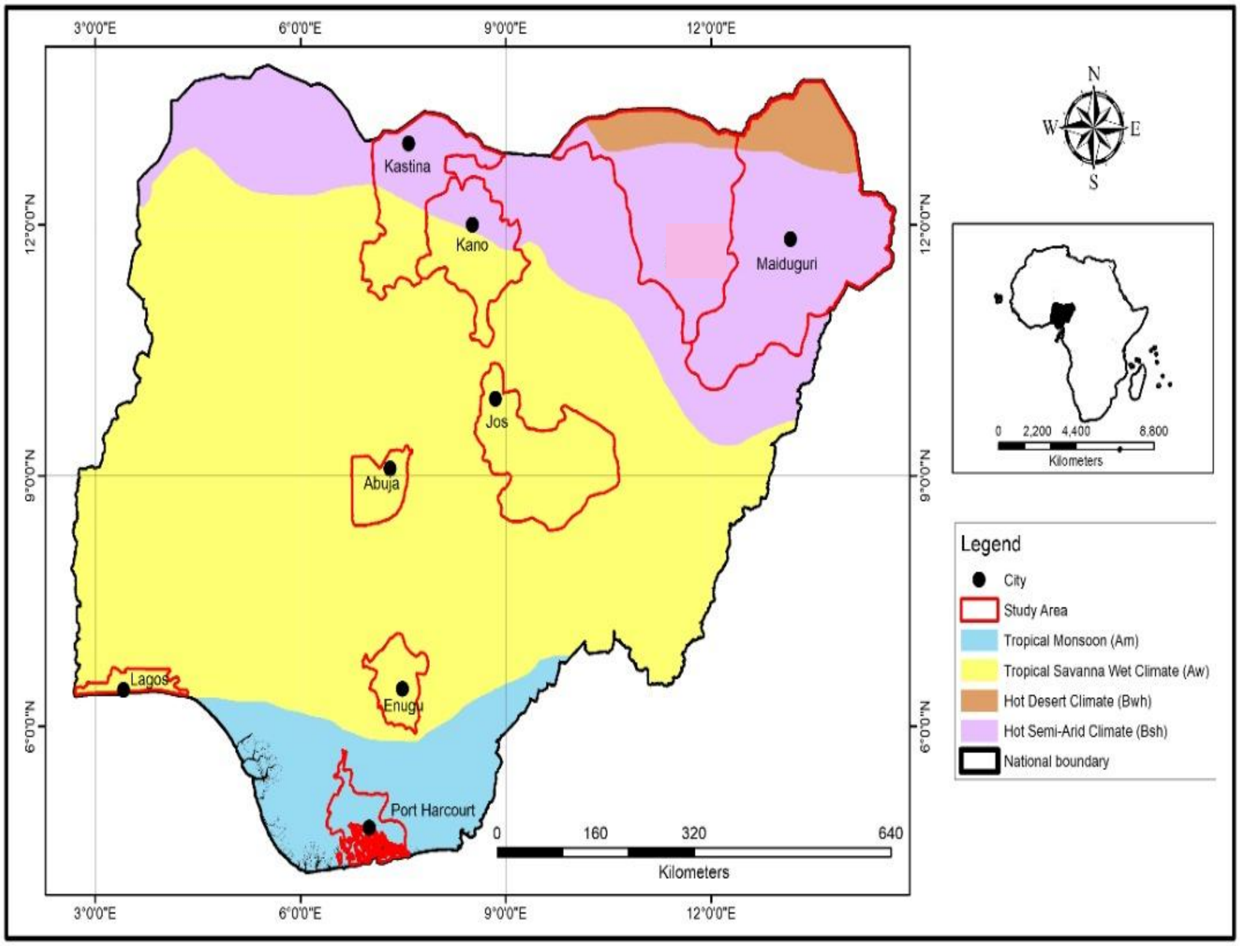

Fig. 1 Study area showing the Four Climatic Belts of Nigeria.
Source : Dept of Geography Cartography Laboratory, Uniport. 2023

2.2 Data collection and Analysis

Data on temperature, humidity, wind speed, and cloud cover at regular intervals throughout the day and night were collected from the Nigerian Meteorological Agency (NiMet) stations strategically located to cover different climatic belts. The data covered a period of 20 years (2003 to 2022) across climatic belts in Nigeria. Time series Cloud Cover (2003 to 2022) from the archives of the Climatic Research Unit (CRU-TS) high resolution gridded time series datasets was obtained and used. Secondary data such as MODIS Land Surface Temperature and Emissivity (MODIS 11) was made use of. This was used to validate the temperature of other areas within the selected cities. The MODIS 11 was also used because of the anomalies of the Landsat imageries and the difference in determining land surface temperature is a maximum of ± 2 °C (Tavares et al., 2019). Some point data were then used to capture the actual temperature value using the zonal statistics tool in the

ArcGIS platform. To collect data on Land Surface Temperature, Moderate Resolution Imaging Spectro-radiometer (MODIS) imageries for 20 epochs (2003 to 2022) from the archives of NASA (https://ladsweb.modaps.eosdis.nasa.gov/: was accessed on the 15th of May 2023) from Level-1 and Atmosphere Archive & Distribution System Distributed Active Archive Center (LAADS DAAC) backup source and were used as secondary data to generate land surface temperature values that enabled for the determination of Urban Heat Island (UHI) fluxes in the selected cities and their suburbs across Nigeria. Also, to analyze the cloud cover data, the study employed ArcGIS Software as a basic analysis tool. The acquired Climatic Research Unit (CRU-TS) high resolution gridded time series datasets were acquired in NetCDF format. The cloud cover NetCDF format data were extracted to raster layers using the Multidimensional tool in the ArcToolbox. These raster layers were further analysed in the GIS environment to calculate for monthly averages in cloud cover within the study period for the study area. The key interpolation method adopted was the Inverse Distance Weighting (IDW) algorithm under Spatial Analyst Tool in the ArcToolbox to generate cloud cover information for the study area. The advantage of the IDW method is this: it is easy to define and therefore easy to understand the results because an interpolating point is most influenced by a nearby points and less by the more distant points "the principle of spatial auto-correlation or Tobler's First Law of Geography" (Burrough & McDonnell, 1998).

Use statistical methods such as regression analysis to identify correlations between cloud cover, urban heat island intensity, and other meteorological variables. Conduct a time-series analysis to examine temporal trends in cloud cover and urban heat island effects throughout the day and night.

1. **Results and discussion**

3.1. The influence of clouds on the UHI during the Dry season across the climatic belts in Nigeria in January between 2003 and 2022.

Secondary data such as MODIS Cloud cover (MOD11) were used. This covers the study period January between 2003 and 2022.

Table 1: Spatial Analysis of cloud cover reading during Dry season for each city from 2003 to 2022 in percentage cloud coverage.

YEAR	PH	LAGOS	ENUGU	ABUJA	JOS	KANO	KATSINA	MAIDUGURI
	Low - High	Low - High	Low - High	Low - High	Low - High	Low - High	Low - High	Low - High
2003	75.1 -78.1	61.0 - 61.8	60.1 - 62.7	45.4 - 47.1	42.2 - 43.3	38.3 - 42.3	19.9 - 24.3	27.8 - 31.7
2004	75.9 - 78.6	66.1 - 66.9	60.2 - 62.9	46.1 - 47.5	42.9 - 44.2	39.8 - 44.0	21.6 - 25.0	27.3 - 31.2
2005	74.1 - 76.9	64.0 - 65.1	59.4 - 61.6	46.9 - 47.5	43.9 - 45.1	41.6 - 44.4	25.4 - 25.7	34.9 - 38.8
2006	74.6 - 77.4	64.2 -65.4	59.3 - 61.6	44.1 - 45.6	41.1 - 41.7	33.8 - 36.3	15.5 - 15.8	23.3 - 27.4
2007	75.3 - 78.1	64.8 - 66.1	59.4 - 61.8	46.6 - 47.2	45.4 - 47.3	45.3 - 48.0	28.0 - 28.3	29.6 - 33.3
2008	75.9 - 78.5	73.6 - 74.8	59.6 - 62.0	48.1 -48.6	45.5 - 47.3	45.4 - 48.4	29.3 - 29.6	30.9 - 34.6
2009	75.9 - 78.5	70.4 - 71.6	59.6 - 61.9	47.7 - 48.2	45.8 - 47.7	45.4 - 47.6	25.8 - 26.4	32.4 - 36.0
2010	73.8 - 76.9	56.6 - 57.8	59.1 - 61.4	44.5 - 45.8	41.9 - 42.7	35.8 - 38.3	17.6 - 17.9	25.6 - 29.9
2011	77.8 - 79.0	77.9 - 78.4	68.8 - 70.8	56.6 - 57.7	45.9 - 48.9	50.9 - 52.1	38.9 - 40.2	44.1 - 45.1
2012	76.8 - 78.6	62.3 - 62.4	63.4 - 66.2	48.2 - 49.6	44.2 - 46.8	48.9 - 50.4	34.4 - 34.8	38.9 - 40.3
2013	76.8 - 78.6	60.1 - 60.3	63.9 - 66.2	48.1 - 49.5	43.9 - 46.5	49.1 - 50.8	35.3 - 35.8	38.7 - 40.2
2014	76.5 - 78.2	61.5 - 61.6	63.3 - 66.1	48.8 - 49.9	45.2 - 47.5	51.7 - 53.6	38.9 - 39.6	37.9 - 39.4
2015	76.4 - 78.0	61.4 - 61.5	63.3 - 66.0	48.1 - 49.7	42.5 - 45.7	44.6 - 46.3	31.7 - 32.6	41.6 - 42.6
2016	76.8 - 78.7	67.1 - 67.3	63.4 - 66.3	50.0 - 50.9	49.2 - 50.5	63.4 - 64.8	48.4 - 48.5	51.8 - 53.0
2017	77.1 -79.1	72.8 - 73.1	63.6 - 66.5	49.5 - 50.4	46.5 - 48.3	56.1 - 57.9	43.2 - 43.7	44.1 - 45.4
2018	76.8 - 78.7	68.5 - 68.8	63.5 - 66.3	51.2 - 51.8	50.4 - 52.0	65.4 - 67.8	50.6 - 51.2	43.9 - 44.8
2019	77.3 - 79.5	71.5 - 71.8	63.6 - 66.5	48.2 - 49.6	45.8 - 47.5	51.5 - 52.7	35.8 - 36.3	41.4 - 42.9
2020	77.4 - 79.6	72.1 - 72.5	63.8 - 66.7	48.2 - 49.7	43.3 - 46.1	46.4 - 47.7	30.7 - 30.8	38.7 - 40.1
2021	77.0 - 78.5	70.5 - 71.6	64.9 - 66.8	53.0 - 54.1	45.1 - 48.9	43.7 - 45.6	23.2 - 24.3	38.0 - 41.2
2022	76.3 - 78.3	56.6 - 60.7	65.5 - 67.3	54.4 - 55.2	46.4 - 47.8	45.6 - 47.5	25.7 - 26.7	38.5 - 41.7

The trend analysis of cloud cover visibility representing dry season distribution over Abuja, Enugu, Kano, Katsina, Lagos, Maiduguri, Port Harcourt, and Jos was assessed, with the highest values in the legend indicating high cloud cover conditions while the lowest values representing low cloud cover. From the analysis, noticeable cloud cover variation exists over the selected cities. The analysis reveals that the area is experiencing an upward trend in cloud cover. Abuja cloud increased at the rate of 0.325 (Figure 2) during the period studied. Port Harcourt cloud increased by 0.065 (Figure 3), Lagos experienced a 0.143 increase (Figure 4), Jos increased by 0.260 (Figure 5), Enugu 0.318 (Figure 6), Kano 0.644 increased (Figure 7), Katsina 0.739 (Figure 8) and Maiduguri had 0.729 increase (Figure 9). Based on the foregoing, Katsina has the highest increase in cloud cover variation while Port Harcourt has the lowest cloud cover variation during the period under study. The trend analysis of cloud cover visibility is displayed in Figures 2, 3, 4, 5, 6, 7, 8 and 9.

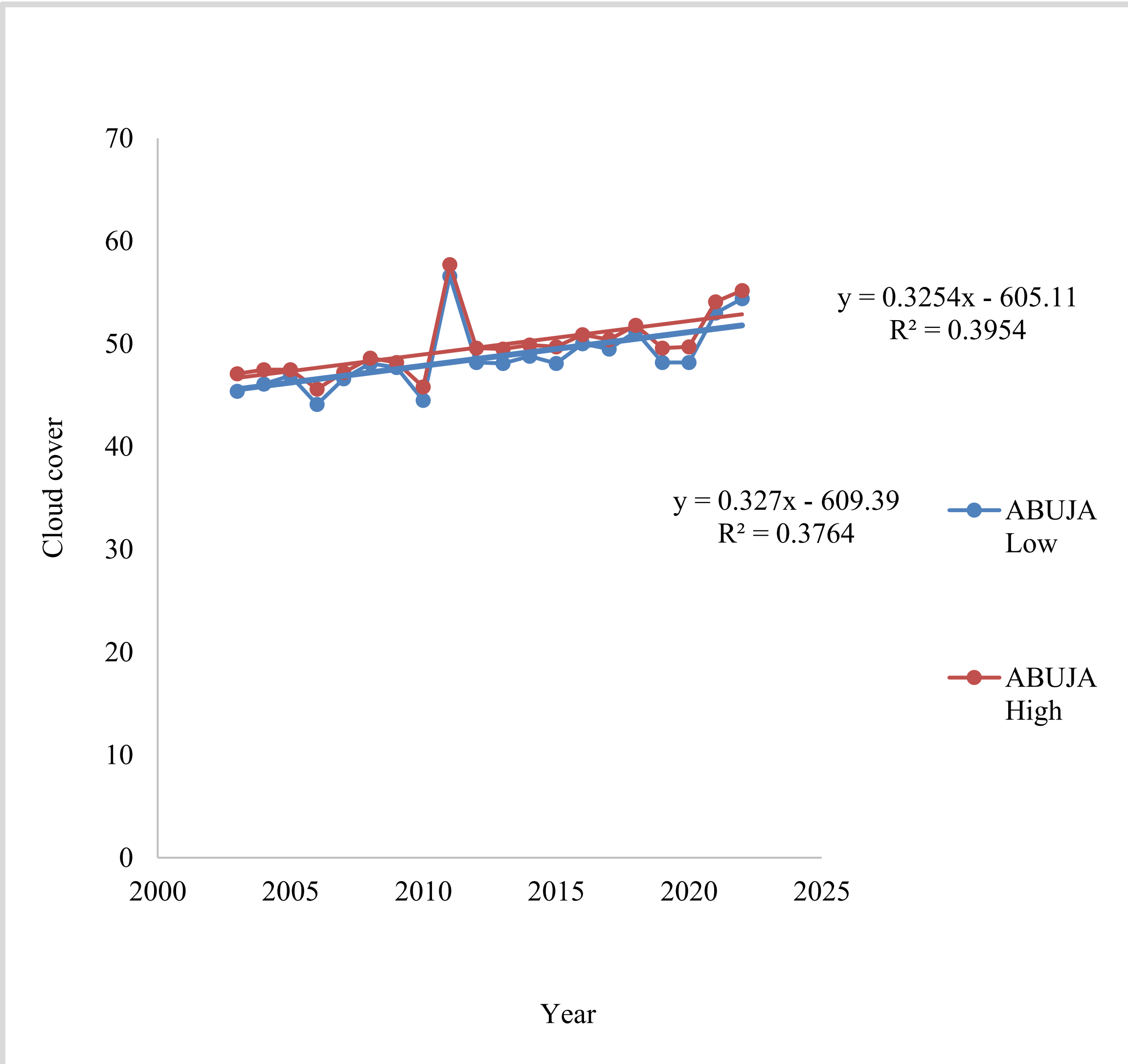

Figure **2:** Average Dry Season cloud cover in Abuja in January between 2003 and 2022

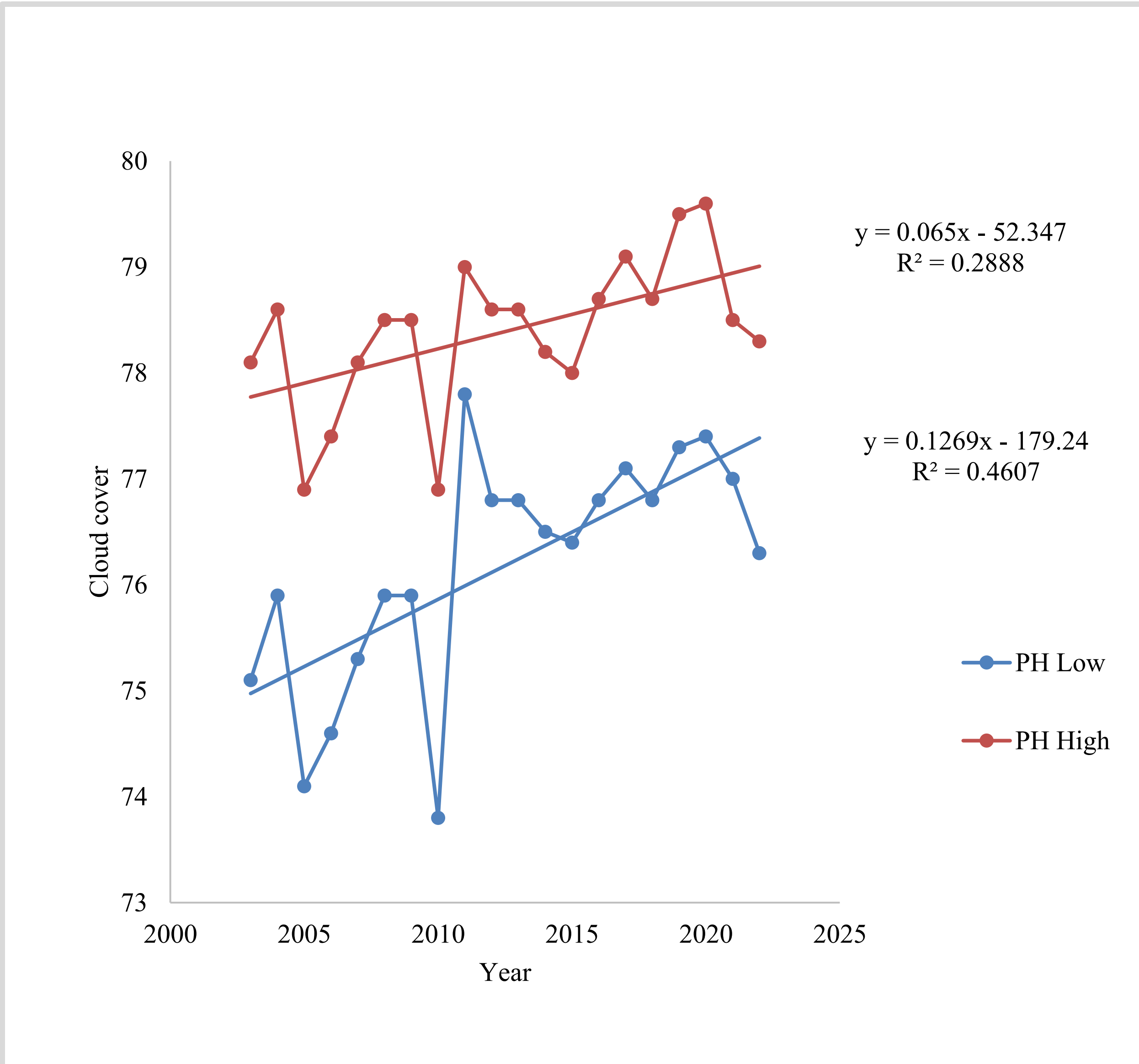

Figure 3: Average Dry Season cloud cover in Port Harcourt in January between 2003 and 2022

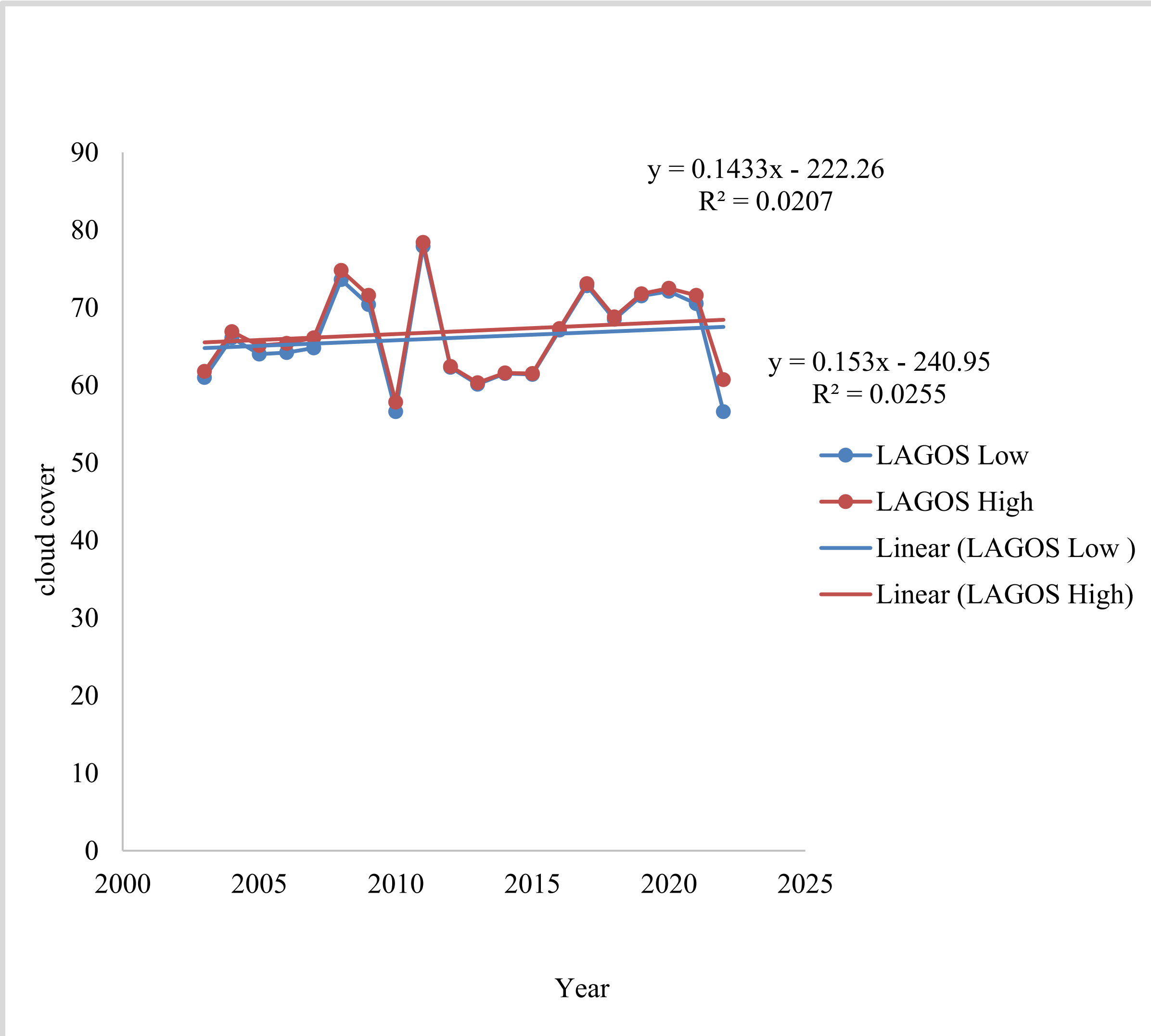

Figure 4: Average Dry Season cloud cover in Lagos in January between 2003 and 2022

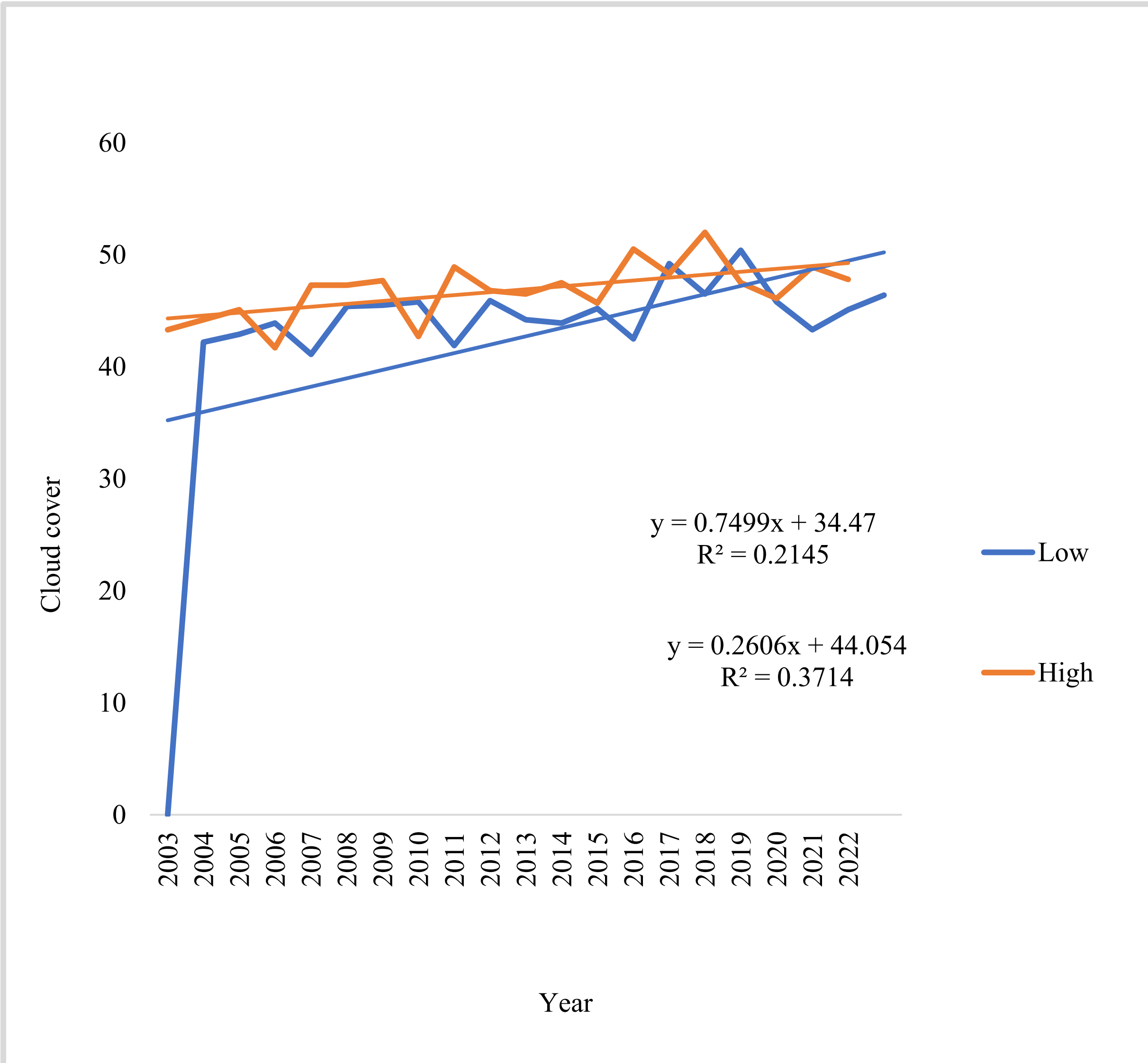

Figure 5: Average Dry Season cloud cover in Jos in January between 2003 and 2022

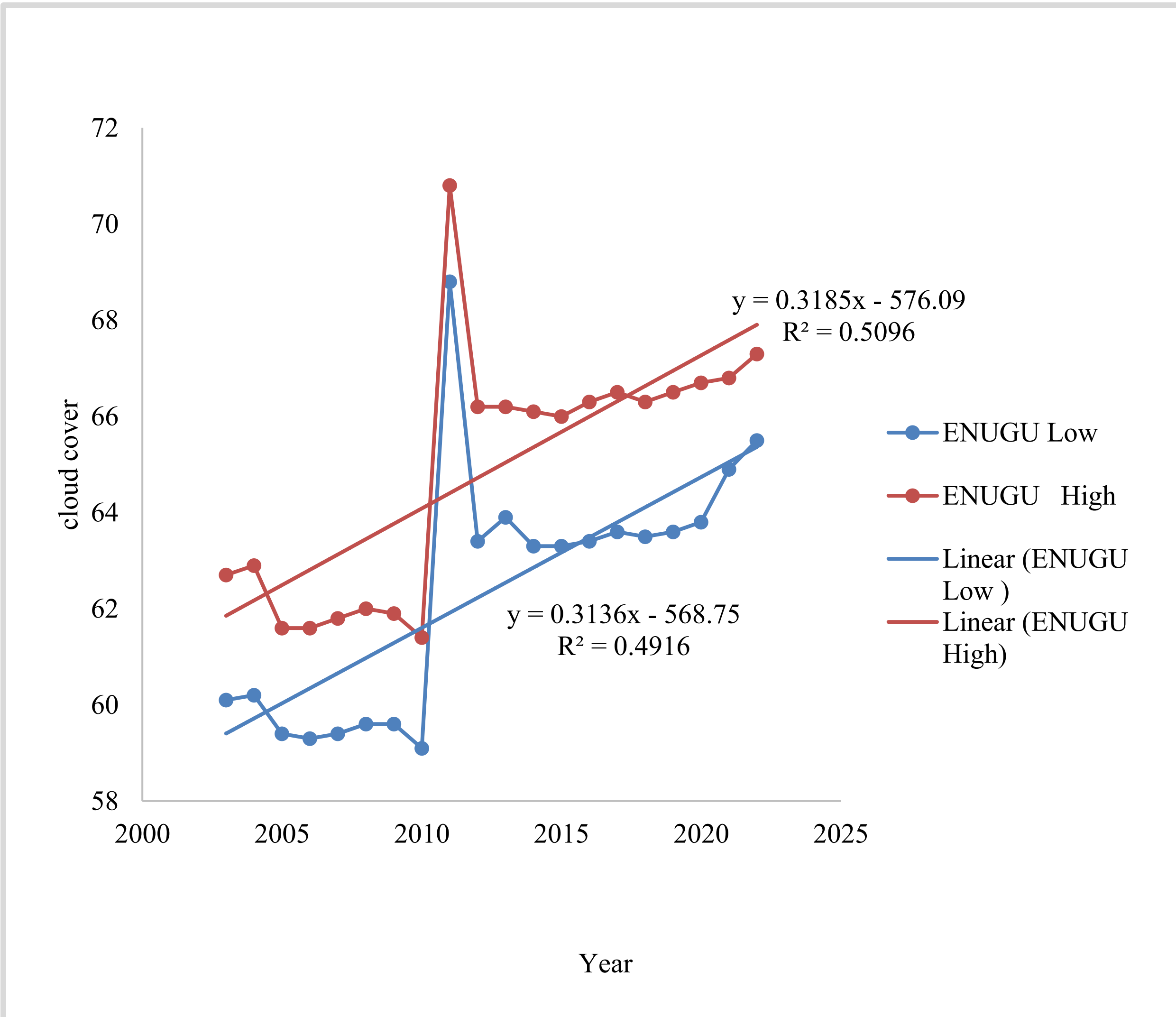

Figure 6: Average Dry Season cloud cover in Enugu in January between 2003 and 2022

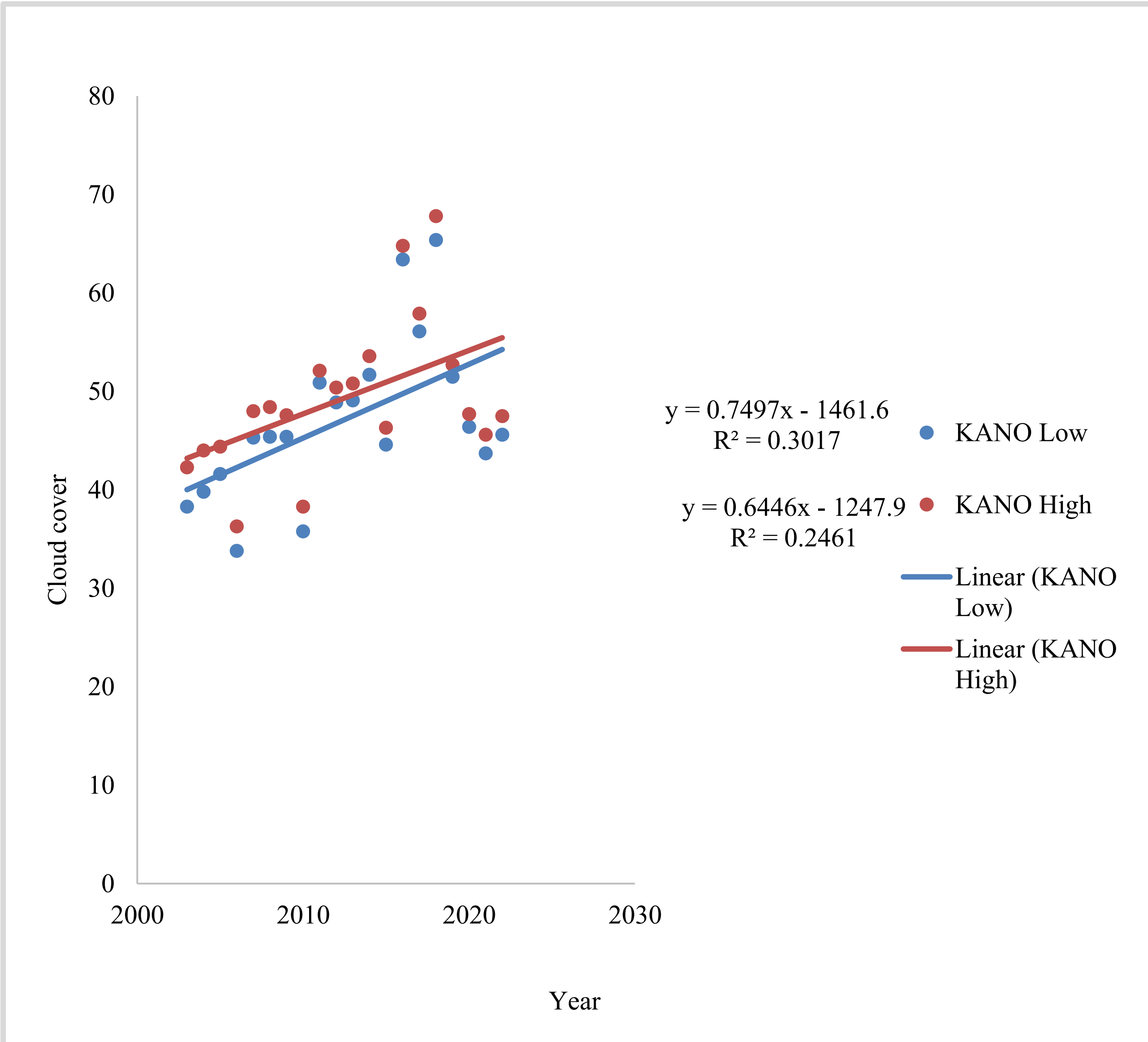

Figure 7: Average Dry Season cloud cover in Kano in January between 2003 and 2022

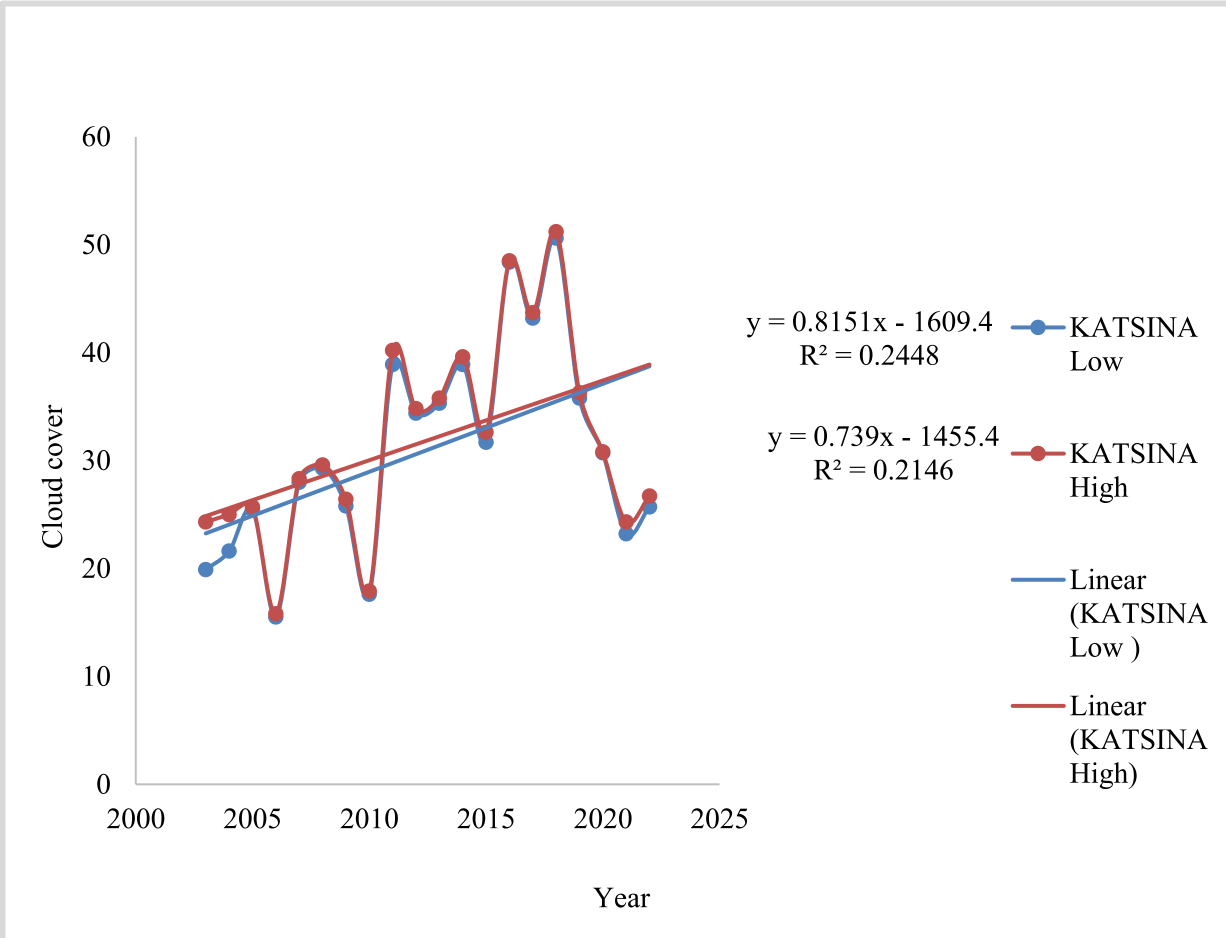

Figure 8: Average Dry Season cloud cover in Katsina in January between 2003 and 2022

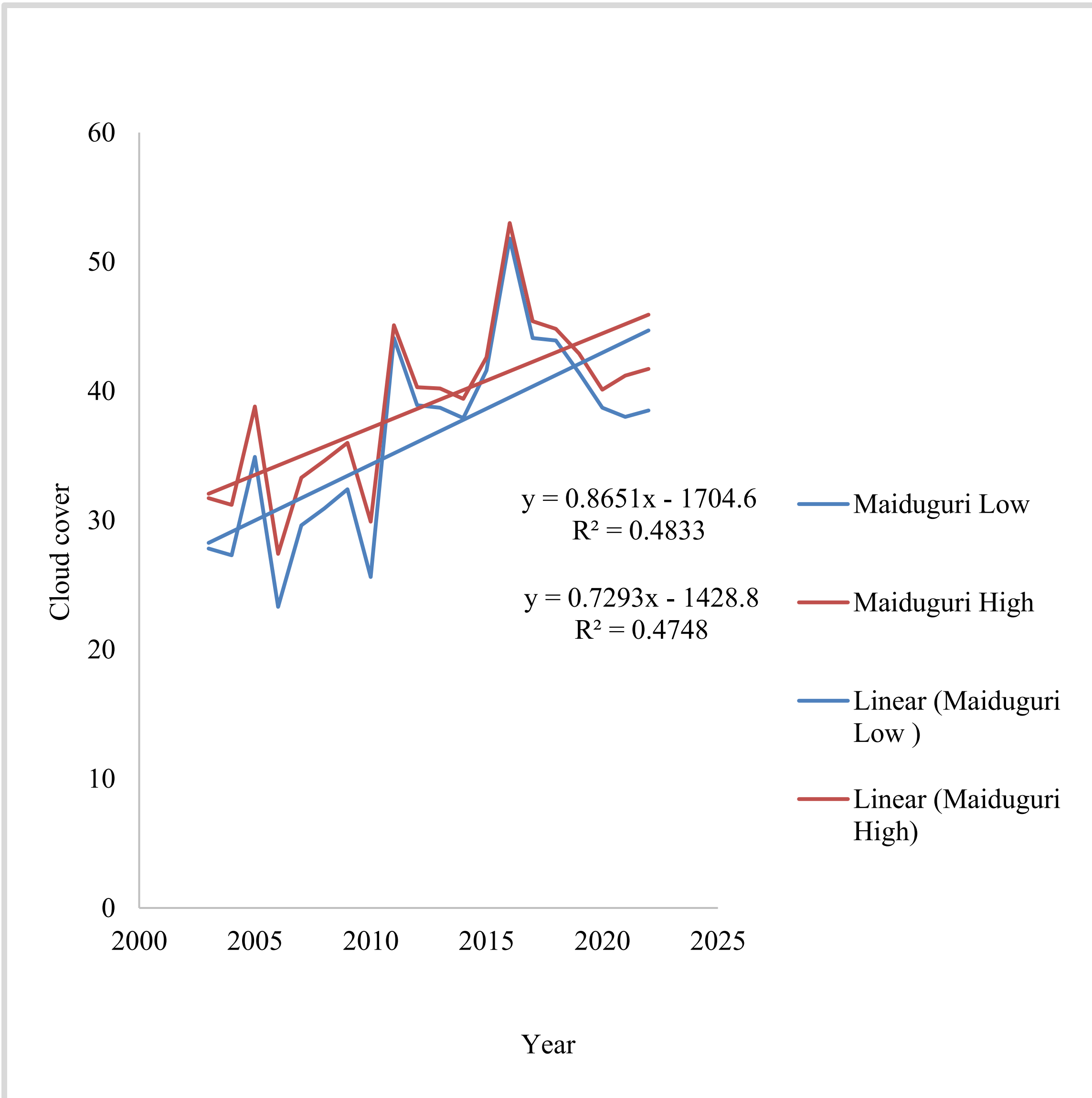

Figure 9: Average Dry Season cloud cover in Maiduguri in January between 2003 and 2022

3.2 The influence of clouds on the UHI during Wet season across the climatic belts in Nigeria in July between 2003 and 2022.

Table 2: Spatial distribution of Cloud cover reading during wet season for each city in percentage cloud coverage from 2003 to 2022

YEAR	PH	LAGOS	ENUGU	ABUJA	JOS	KANO	KATSINA	MAIDUGURI
	Low - High	Low - High	Low - High	Low - High	Low - High	Low - High	Low - High	Low - High
2003	95.7 - 95.9	85.2 - 86.2	90.9 - 92.1	83.7 - 84.9	78.8 - 80.9	58.9 - 62.6	42.4 - 42.5	60.4 - 64.7
2004	95.8 - 96.1	87.7 - 88.8	90.9 - 92.1	83.7 - 84.8	78.1 - 80.5	57.5 - 61.3	41.0 - 41.1	60.3 - 64.6
2005	96.1 - 96.5	94.8 - 95.9	90.9 - 92.1	83.8 - 84.9	78.9 - 80.9	58.9 - 62.6	42.5 - 42.5	60.3 - 64.7
2006	96.0 - 96.4	89.7 - 90.7	90.9 - 92.1	83.7 - 84.9	78.8 - 80.9	58.9 - 62.6	42.4 - 42.5	60.4 - 64.7
2007	96.0 - 96.3	94.5 - 95.5	90.9 - 92.1	83.9 - 85.0	78.6 - 80.8	58.6 - 62.3	42.2 - 42.2	60.4 - 64.7
2008	96.1 - 96.5	94.1 - 95.0	90.9 - 92.1	84.4 - 85.2	80.3 - 82.1	62.3 - 66.1	45.9 - 46.0	60.6 - 65.0
2009	96.1 - 96.5	90.7 - 91.7	90.9 - 92.1	83.0 - 84.4	75.2 - 78.6	51.4 - 55.3	34.7 - 34.9	59.9 - 64.0
2010	95.9 - 96.2	88.6 - 89.7	90.9 - 92.1	84.0 - 85.0	78.8 - 80.9	58.9 - 62.6	42.5 - 42.6	60.4 - 64.5
2011	95.7 - 96.2	93.0 - 94.4	94.1 - 95.3	88.5 - 89.1	87.8 - 88.6	72.7 - 74.6	59.5 - 60.3	76.9 - 78.6
2012	95.5 - 96.5	94.5 - 95.4	93.5 - 94.7	86.2 - 86.8	82.5 - 83.6	67.3 - 69.5	51.8 - 52.3	68.1 - 70.4
2013	95.4 - 96.3	93.1 - 94.1	93.4 - 94.6	85.5 - 86.3	81.8 - 82.8	62.6 - 64.9	46.3 - 46.5	67.0 - 69.8
2014	95.8 - 96.9	99.9 - 100.0	93.6 - 94.9	85.7 - 86.5	80.8 - 82.7	62.1 - 64.5	45.7 - 45.9	66.9 - 69.7
2015	94.5 - 95.3	82.5 - 83.6	93.0 - 94.2	85.2 - 86.0	82.8 - 83.7	68.2 - 70.3	52.2 - 52.3	68.3 - 70.4
2016	94.9 - 95.7	89.5 - 90.5	93.2 - 94.4	85.4 - 86.1	83.5 - 84.1	70.5 - 72.4	54.3 - 54.5	68.8 - 70.8
2017	95.7 - 96.7	93.9 - 94.9	93.4 - 94.7	85.3 - 86.2	81.4 - 82.9	63.7 - 66.1	47.4 - 47.4	67.3 - 69.9
2018	95.2 - 96.0	90.7 - 91.7	93.3 - 94.5	85.5 - 86.3	80.7 - 82.9	61.5 - 63.9	45.3 - 45.7	66.8 - 69.6
2019	93.5 - 94.6	76.8 - 78.0	92.7 -93.8	85.4 - 86.2	82.1 - 83.3	66.0 - 68.2	49.9 - 50.0	67.8 - 70.1
2020	95.4 - 96.4	96.8 - 97.7	93.5 - 94.7	85.9 - 86.6	81.7 - 83.2	61.8 - 67.1	48.8 - 49.0	67.5 - 70.0
2021	95.7 - 95.9	86.9 - 89.1	91.5 -92.6	83.5 - 84.8	79.9 - 82.0	60.3 - 63.2	41.1 - 42.1	60.1 - 64.8
2022	96.3 - 96.3	93.2 - 95.3	91.6 - 92.9	84.5 - 85.4	82.1 - 83.5	64.8 - 67.6	45.7 - 46.7	61.3 - 65.8

Results of the trend analysis of cloud cover for the wet season is assessed with the lowest values in the legend representing areas with low cloud cover visibility while high values indicate high atmospheric cloud cover visibility. From the analysis, the marked variation in cloud cover exists over time across the selected cities. The variability of cloud cover during the wet season revealed that, Katsina and Kano had the highest variation rate of 0.360 and 0.307, while Maiduguri recorded 0.242, Abuja 0.063 with Jos and Enugu witnessing almost similar cloud cover values of 0.154 and 0.120. In the same vein, the cloud cover of Abuja, Enugu, and Jos were similar while Lagos and Port Harcourt witnessed the least cloud cover variation rate ranging from -0.019 and -0.022 during the wet season. From the analysis, negative trend in cloud variation was observed only in the Tropical Wet climate while positive variation was exhibited in the other climatic belts..

Hypothesis: There is no significant relationship in the influence of Cloud Cover on UHI from the years 2003 and 2022.

Table 3: Analysis of variance of regression on the influence of Cloud Cover on UHI from the years 2003 and 2022.

Model		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	7.583	1	7.583	7.837	.012
	Residual	17.417	18	.968		
	Total	25.000	19			

a. Dependent variable: UHI from the year 2003 and 2022.

b. Predictor: (Constant): Influence of Cloud

Table 3 shows that the F-value of 7.837 is significant at .012. This indicated that the UHI from 2003 to 2022 was significantly related to the influence of cloud. Therefore, the null hypothesis of no significant linear relationship between the influence of cloud on UHI from the years 2003 and 2022 was rejected.

Table 4: Model Summary on the Influence of Cloud on UHI from the years 2003 and 2022.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.551	.303	.265	.98366

Predictor: (constant), Cloud

The coefficient of determination (R^2) is .303. This indicates that 9.18% of the variance in the UHI from 2003 to 2022 is caused by variations in the predictor variable (influence of Cloud). Therefore, 9.18% of the variance in the UHI from the year 2003 to 2022 is predicted by the influence of cloud.

Table 3: t-values of UHI from the year 2003 to 2022 and the influence of cloud

	Unstandardized	Standardized

Model	Coefficients		Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-14.218	5.976		2.379	.029
Cloud	.249	.089	.551	2.800	.012

(** Sig. at $P < 0.05$), dependent variable: UHI 2003 to 2022

To determine if the predictor variable (influence of cloud) was significantly related to or predicted the UHI from 2003 to 2022, the t-value was presented in Table 3. The t-value for the influence of cloud was 2.379, $P < 0.29$). The influence of cloud had a significant relationship ($P < 0.029$) with and predicted the UHI from the year 2003 to 2022.

Discussion of Findings

This research examined the influence of clouds on the Urban Heat Island (UHI) effect during the dry and wet seasons across various climatic belts in Nigeria from January 2003 to January 2022, utilizing MODIS Cloud cover data (MOD11). The analysis revealed significant variations and trends in cloud cover over time, highlighting differences across the selected cities.

During the dry season, the trend analysis indicated an overall increase in cloud cover across all cities, with the most substantial increases observed in Katsina (0.739) and Maiduguri (0.729), and the smallest increase in Port Harcourt (0.065). This upward trend suggests a potential mitigating effect on the UHI, as increased cloud cover can reduce surface temperatures by limiting solar radiation. However, the extent of this mitigation varies regionally, influenced by local climatic conditions and urban characteristics.

In contrast, the wet season analysis showed mixed trends. Katsina and Kano exhibited the highest increases in cloud cover (0.360 and 0.307, respectively), while Lagos and Port Harcourt showed slight negative trends (-0.019 and -0.022). The negative trends observed in these coastal cities might be linked to their tropical wet climate, which typically experiences consistent high humidity and rainfall, reducing the variability of cloud cover. The differences in cloud cover trends between seasons underscore the complexity of atmospheric interactions and their impact on UHI.

Comparing these findings with existing literature, the results align with studies that have shown cloud cover plays a significant role in modulating urban temperatures. For instance, increased cloud cover is generally associated with lower daytime temperatures and reduced UHI intensity due to decreased solar insolation (Mao et al., 2019). But clouds can also increase nighttime UHI because they retain longwave radiation that is released into space, underscoring the double function of clouds in controlling urban climate (Sobstyl et al., 2018).

The implications of these findings are substantial for urban planning and climate adaptation strategies. The observed increase in cloud cover during the dry season across most cities suggests a potential natural buffer against extreme heat events. However, urban areas must also consider the potential for increased nocturnal warming due to cloud cover. Understanding these dynamics can inform the development of urban green spaces and reflective surfaces to further mitigate UHI effects.

The findings emphasize the need for tailored urban climate strategies that consider both seasonal and regional variations in cloud cover to effectively mitigate UHI impacts and enhance urban resilience to climate change.

4. Conclusion

In conclusion, this study underscores the significant influence of cloud cover on the Urban Heat Island (UHI) effect across various climatic belts in Nigeria. The analysis revealed notable trends in cloud cover during both the dry and wet seasons, with implications for urban temperature regulation. While increased cloud cover during the dry season may offer a natural buffer against extreme heat events, the variability of cloud cover across seasons and regions necessitates tailored climate adaptation strategies.

Based on these findings, the following recommendations are proposed. First, implement integrated monitoring systems combining satellite-derived data with ground-based observations to enhance the accuracy and resolution of cloud cover analysis. Second, encourage the development of urban green spaces and reflective surfaces to mitigate the Urban Heat Island effect and counteract potential nocturnal warming associated with increased cloud cover. Third, incorporate climate-resilient urban planning strategies that consider both seasonal and regional variations in cloud cover to effectively mitigate UHI impacts and enhance urban resilience to climate change. Finally, conduct long-term research to assess the evolving dynamics of cloud cover and its impact on the Urban Heat Island effect, considering broader climatic trends and urbanization patterns. By implementing these recommendations, policymakers, urban planners, and stakeholders can work towards creating more sustainable and climate-resilient cities in Nigeria and beyond.

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Quantification of the Influence of Wind Speed on Diurnal (Day and Night) Urban Heat Island Across Climatic Belts in Nigeria

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Abstract:

This study investigates the influence of wind speed on diurnal urban heat islands (UHI) across climatic belts in Nigeria using meteorological and remote sensing data analysis. Remote sensing techniques were utilized to collect data such as LST, GPS ground truth points, MODIS & Landsat images, and wind speed data from NASA spanning 20 years (2003-2022). The UHI intensity was calculated by determining the temperature difference between urban and rural areas. Statistical regression analysis was employed to quantify the influence of wind speed on UHI, considering other meteorological variables as potential confounding factors. The results indicate that wind speed slightly increased the UHI intensity in selected cities during the dry season and decreased it during the rainy season between 2003 and 2022. However, the correlation coefficient between wind speed and UHI intensity was found to be insignificant ($r = .093$, $p < .706$), suggesting a minimal direct influence of wind speed on UHI variations. These findings contribute to a better understanding of UHI dynamics in Nigeria and have implications for urban planning and climate resilience strategies in the region.

Keywords: Urban heat island, Wind speed and Remote sensing.

1. Introduction

The Urban Heat Island (UHI) phenomenon, characterized by significantly warmer urban areas compared to their surrounding rural environment, has garnered global recognition as a crucial element of wind and climate dynamics (Panos et al., 2023). Extensive research from various countries, including the USA, South Korea, Indonesia, India, and China, has underscored the prevalence of UHI in urban settings, particularly during dry periods like summer (Guoyu et al., 2023; Shivam, Chauhan & Jethoo, 2023; Naika et al., 2022; Huanchun et al., 2023). Studies have elucidated specific UHI dynamics, revealing nocturnal diurnal reinforcement of heat islands and distinct temperature changes before sunrise and after sunset (Menglin et al., 2023). These findings elucidate the composition of the Surface Urban Heat Island (SUHI), primarily driven by anthropogenic heat sources and impervious surface coverage (Ayyoob & Sharifi, 2023).

Nigeria, characterized by diverse climatic belts, offers a unique context for studying UHI dynamics (Adeleye, Connor & Haberle, 2021). The UHI effect in Nigeria is not only influenced by urbanization but also by climatic variability across different regions of the country (Adeleye, Connor & Haberle, 2021). Of particular importance is the role of wind speed in moderating urban temperatures, with high wind speeds facilitating heat dispersion and low wind speeds exacerbating the UHI effect (Zong et al., 2021). Despite significant research on UHI in Nigerian cities like Lagos, Abuja, and Kano, there remains a notable gap in understanding how wind speed influences diurnal UHI patterns across different climatic regions in the country (Al-Obaidi et al., 2021).

Addressing this gap is crucial for informing effective urban planning strategies and enhancing climate resilience in Nigeria. In light of the aforementioned research context, this study aims to investigate the influence of wind speed on diurnal urban heat islands across climatic belts in Nigeria. By examining the interplay between wind speed and UHI dynamics in different climatic regions, this research seeks to contribute to a deeper understanding of urban climate processes in Nigeria and inform evidence-based urban planning strategies aimed at mitigating heat-related risks and enhancing urban resilience in a changing climate context.

2. Materials and Methods

a. *Study area*

The study focuses on Nigeria, a country located in West Africa, bordered by Benin to the west, Niger to the north, Chad to the northeast, and Cameroon to the east. To the south, it is bordered by the Gulf of Guinea, providing access to the Atlantic Ocean. Nigeria's geographic coordinates range from approximately 4° to 14° North latitude and 3° to 15° East longitude, spanning a total area of around 923,768 square kilometers (Folorunso, 2021). The country encompasses diverse climatic zones, including tropical rainforests in the south, savannas and woodlands in the central regions, and arid and semi-arid conditions in the north, influenced by the West African monsoon system and the intertropical convergence zone (ITCZ) (Vallet-Coulomb et al., 2020). This geographic and climatic diversity makes Nigeria an ideal location for studying the influence of cloud cover on diurnal variations of the urban heat island phenomenon across different climatic belts. The study focuses on eight (8) major urban areas across different climatic belts: Tropical Wet Climate (Lagos & Port Harcourt), Tropical Savanna (Abuja & Enugu), Hot Semi Arid (Kano, Kastina & Maiduguri) and Montane (Jos) in Nigeria.

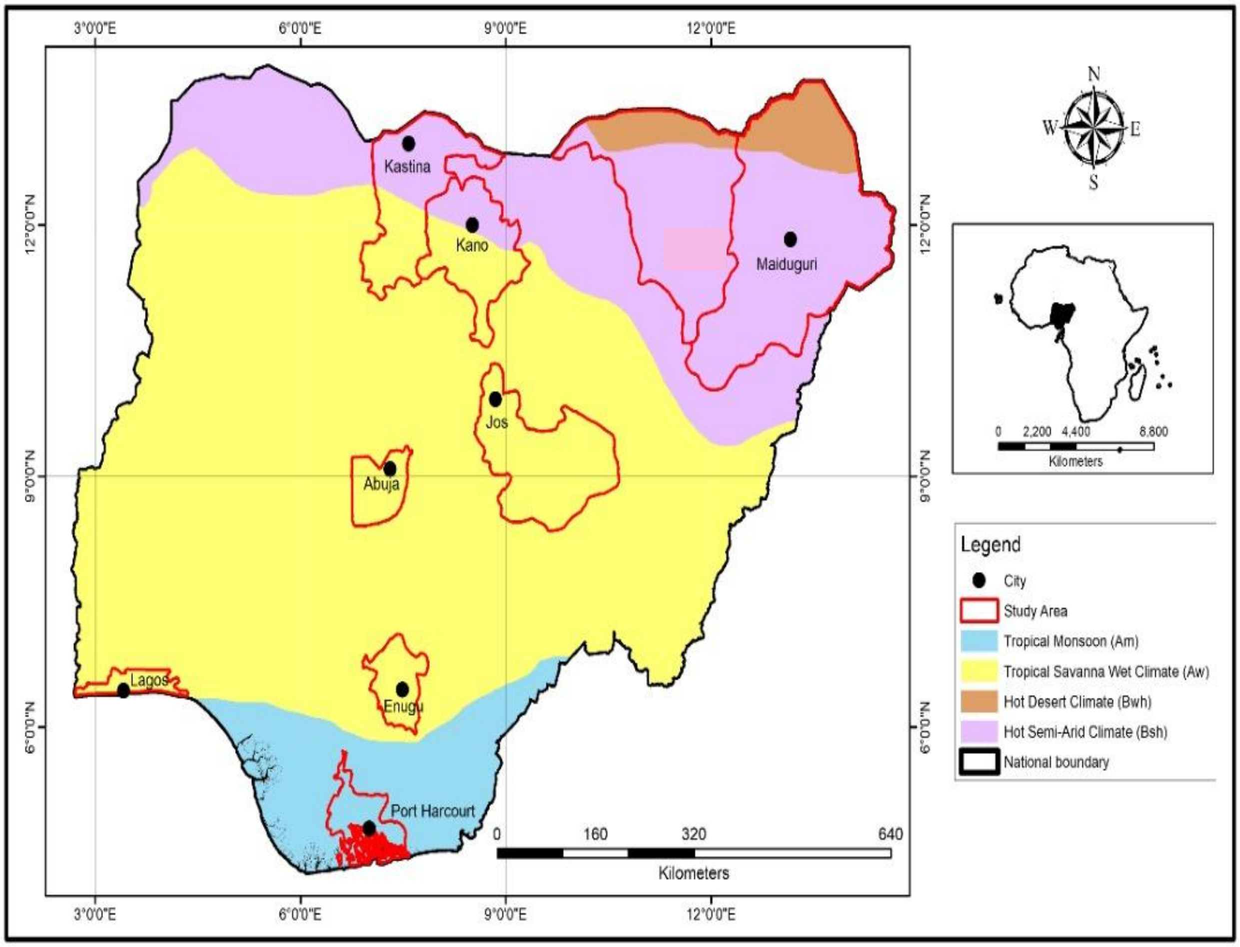

Fig. 1 Study Area showing the Four Climatic Belts of Nigeria
Source : Dept of Geography Cartography Laboratory, Uniport. 2023.

b. ***Meteorological data***

Satellite imagery from MODIS is utilized to identify wind speed on diurnal (day and night) urban heat islands across climatic belts and surface temperatures over urban areas in Nigeria. Land use/land cover data are also incorporated to assess urbanization patterns.

Ground-based meteorological observations, including temperature, humidity, wind speed, and solar radiation, are collected from stations located within urban areas and surrounding regions across different climatic zones.

The temperature difference between urban and rural areas is calculated to determine UHI intensity. Spatial and temporal variations in UHI intensity are analyzed.

The difference in temperature between urban and rural regions at a given time is known as UHI intensity (UHII). The non-urban points must be located outside of the built-up urban region or any surface that has been altered by constructions (asphalt, cement, etc.) since this site has traditionally been linked with a rural area. Hence, the UHII was calculated for every hour of the day from 2003 to 2022 according to the following equation:

$\mathbf{\Delta Ti} = T_{Urb} - T_{Rur}$ (mean) (1)

Where ΔTi represents the UHII,

T_{urb} is the 2 m temperature for each urban grid point and

T_{rur} (mean) is the 2m temperature averaged over the rural grid points.

Additionally, to find associations between local WTs and urban overheating (UO), and have a clearer view of these associations, we have used also the higher 5% of daily maximum ΔTi for both daytime and nighttime.

However, the city bounds are frequently erroneous since the urban continuum occasionally lacks distinct boundaries, suggesting a shift toward normally rural land usage (Karim et al., 2020). In our case, the rural area is represented by the rural classes of CORINE (coordination of information on the environment) covering grassland, cropland, shrub-land, woodland, broadleaf forest and needleleaf forest (https://land.copernicus.eu/pan-european/corine-land-cover). More specifically, according to the land-sea mask, land area receives value 1 and is represented by the land classes of CORINE, sea area receives missing value NaN and is represented by the sea classes of CORINE, while according to the rural-urban mask, the rural area receives value 1 and is represented by the rural classes of CORINE, the urban area receives missing value NaN and is represented by the urban classes of CORINE.

Regression analysis is performed to quantify the influence of wind speed on the UHI, considering other meteorological variables as potential confounding factors.

Table 1

Land Surface Temperature	**Moderate Resolution Imaging Spectroradiometer (MODIS) https://ladsweb.modaps.eosdis.nasa.gov/**	**2003-2022**	**8 Days 1km Gridded**	**Land Surface Temperature Distribution**
Wind Speed	**NASA's GMAO/MERRA-2 (GEOS 5) https://power.larc.nasa.gov/data-access-viewer/**	**2022-2023**	**-**	**Monthly Daiy Wind Speed Distribution Data.**
GPS Coordinate	**Field W Ork**	**2022**	**-**	**Ground Truth Data For Change Detection**

Source: Researcher's FieldWork, 2023

3. Results and discussion

3.1 The influence of wind speed on the Urban Heat Island in Nigeria between January and July 2003 to 2022

The trend analysis of wind speed influence on the Urban Heat Island at 10 meters above sea level over the eight (8) selected cities in Nigeria for the months of January and July between 2003 and 2022 are presented in Figure 2 – 8. However, it was observed that the wind speed trend, observed in Abuja, Kano, Lagos, Jos, Port Harcourt, Maiduguri and Enugu cities were slightly increased at the rate of 0.018m/s, 0.010m/s, 0.001m/s, 0.036m/s, 0.0002m/s, 0.010m/s and 0.020m/s during the dry season and reduced at the rate of -0.007m/s, -0.001m/s, -0.009m/s, -0.005m/s, -0.011m/s, -0.005m/s and -0.018m/s during the rainy season respectively (Figure 2-8) while Katsina experienced a 0.021m/s increase in the dry season and a 0.002 m/s during the rainy season (Figure 9).

Based on the foregoing, all the eight cities across the climatic belts witnessed increased wind speed during the dry season and decreased wind speed during the rainy season except for Katsina. The city of Jos, had the highest increase in wind speed while Port Harcourt had the lowest between January 2003 and 2022 (Dry season) during the period under study. On the other hand, Kano had the highest increase in wind speed while Port Harcourt recorded the lowest in July between 2003 and 2022 (Rainy season) during the period under study.

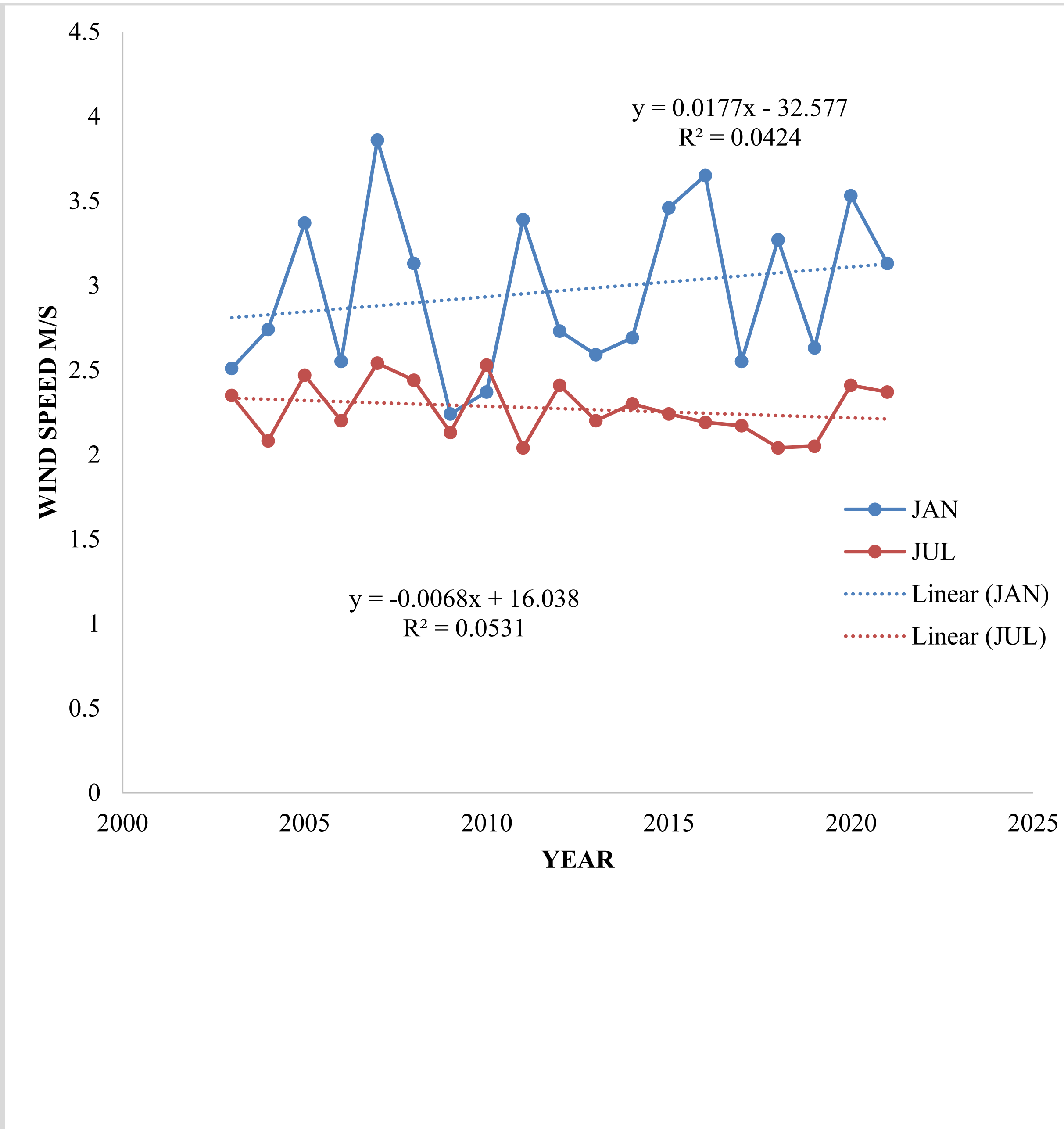

Figure 2 Seasonal Variation of Wind Speed of Abuja

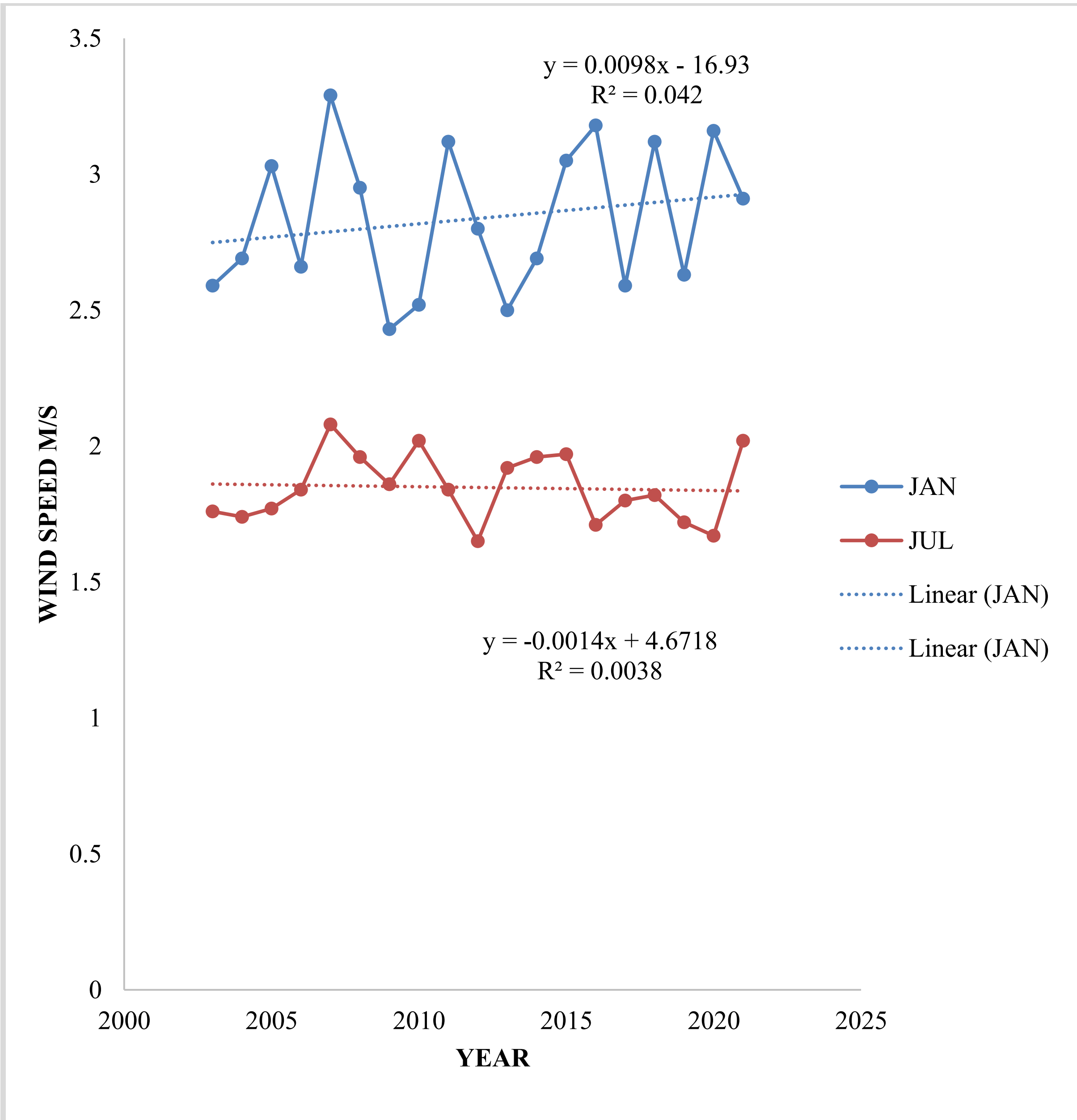

Figure 3: Seasonal Variation of Wind Speed of Kano

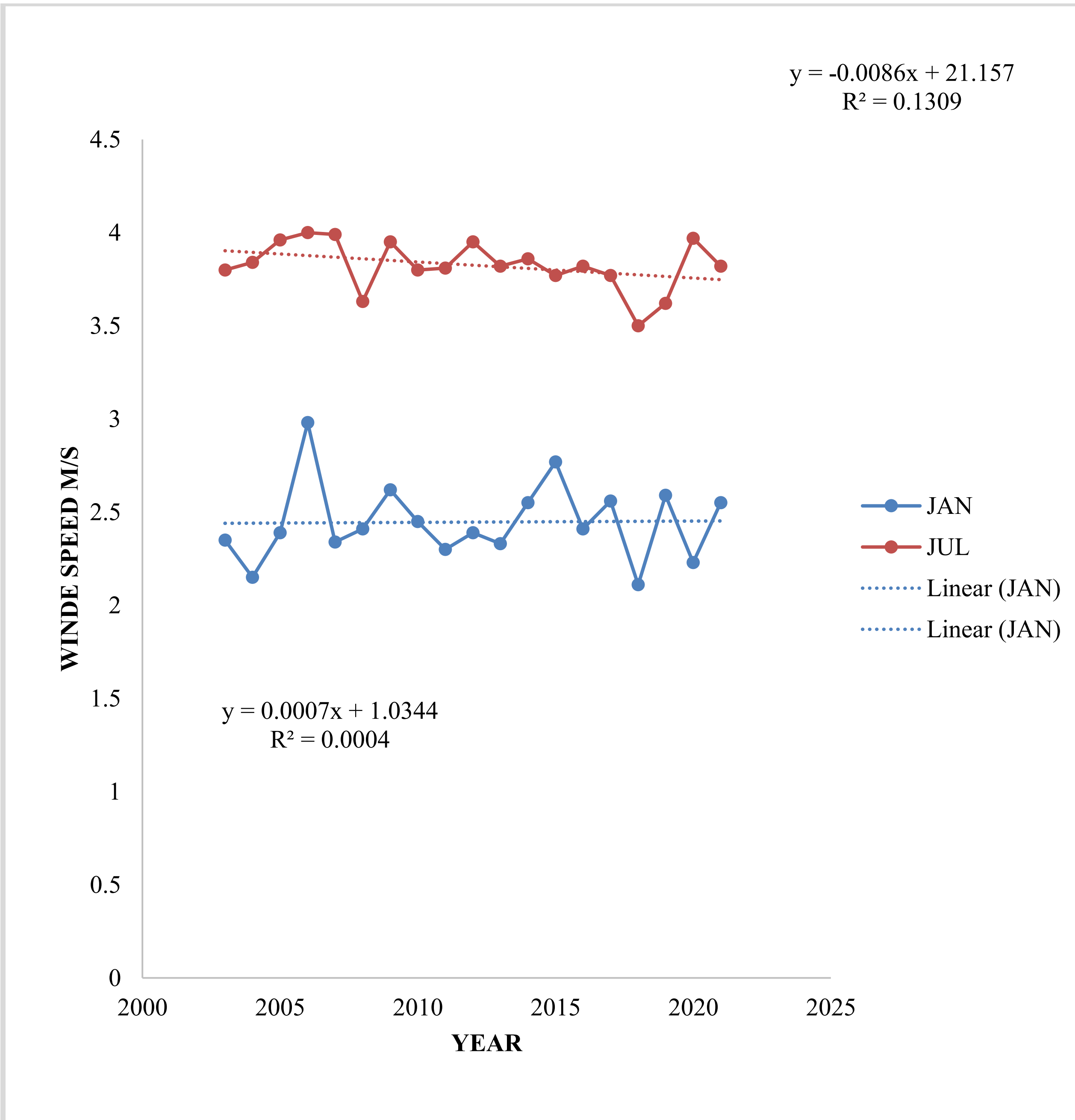

Figure 4: Seasonal Variation of Wind Speed of Lagos

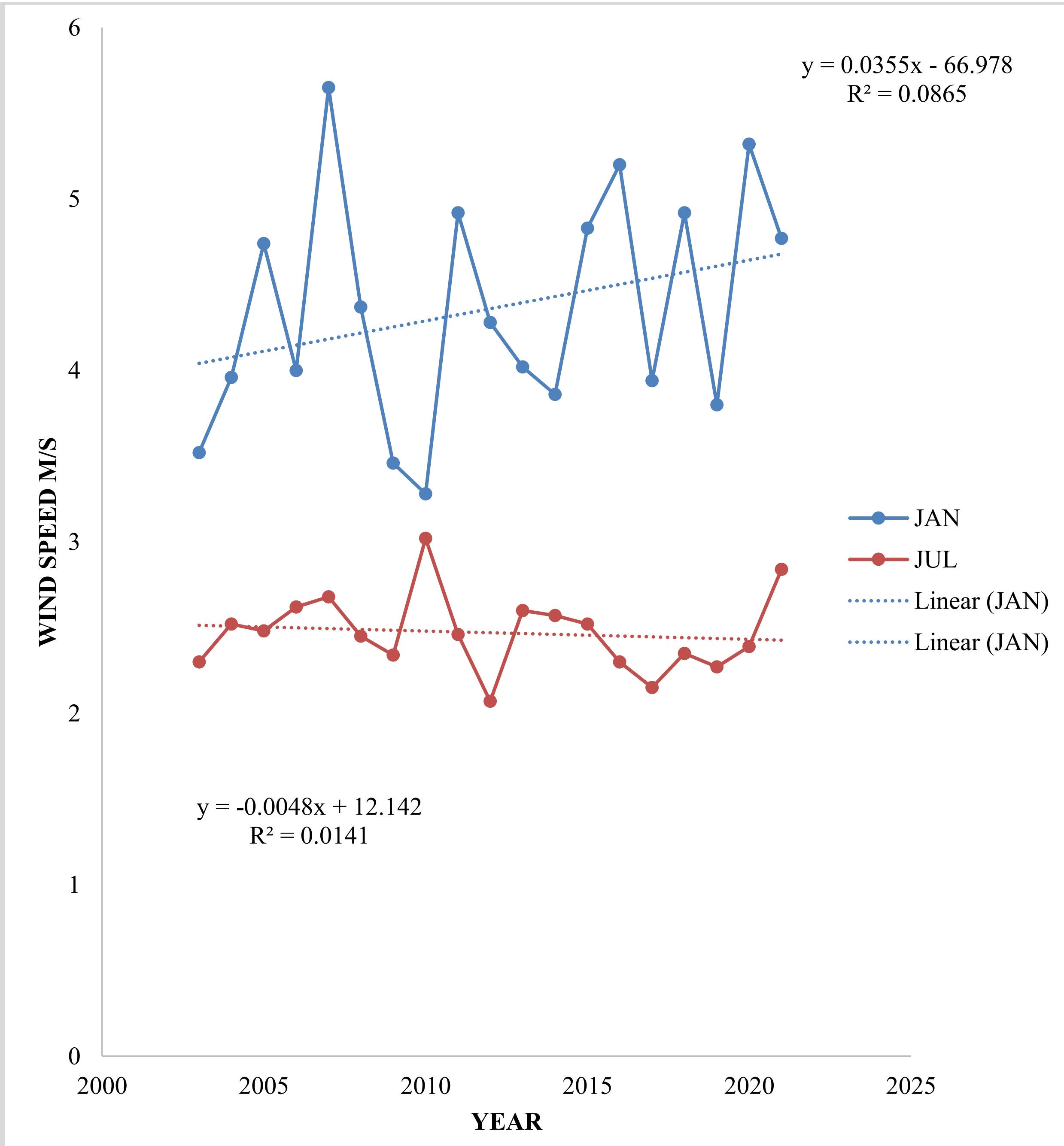

Figure 5: Seasonal Variation of Wind Speed in Jos

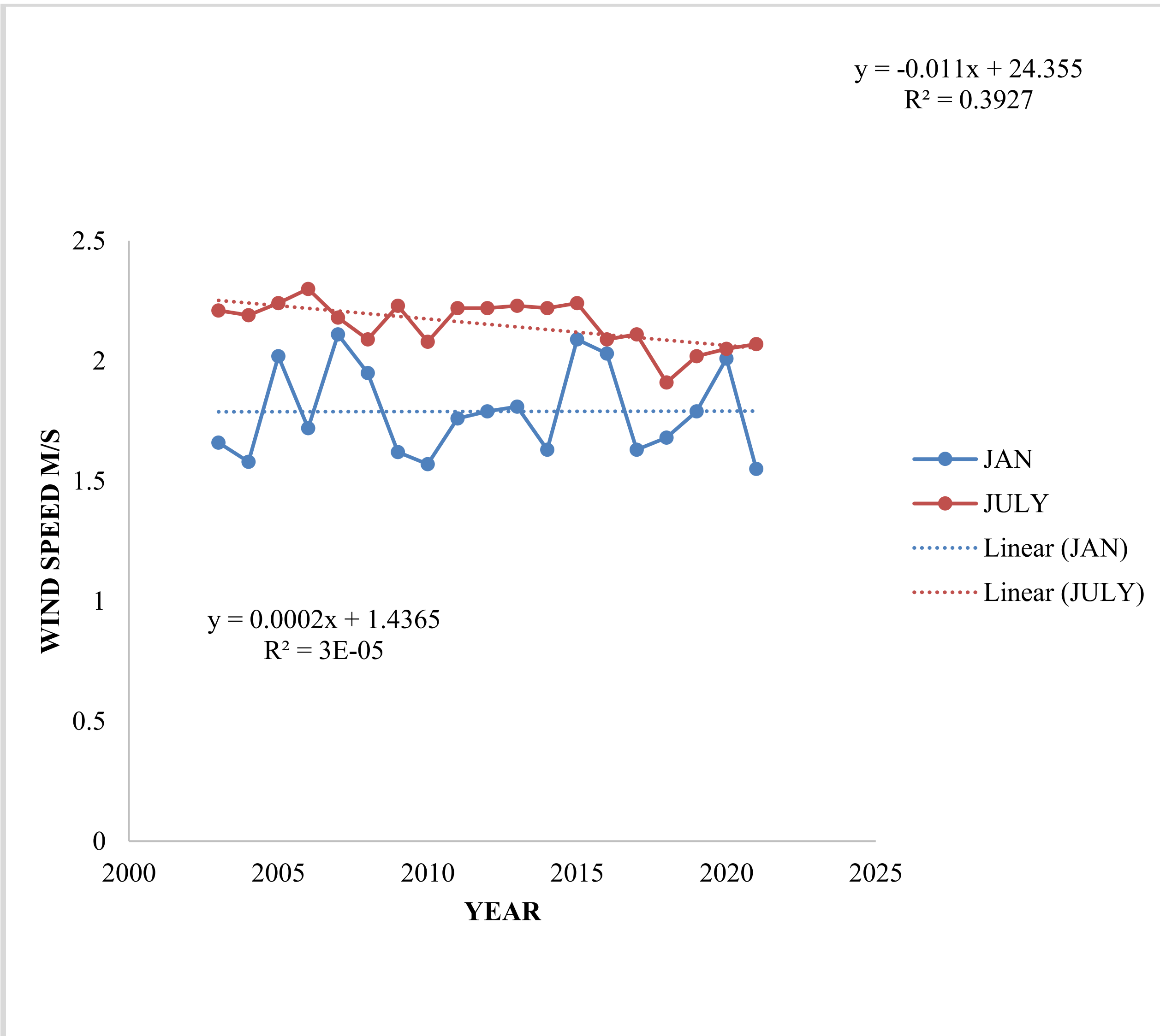

Figure 6: Seasonal Variation of Wind Speed in Port Harcourt.

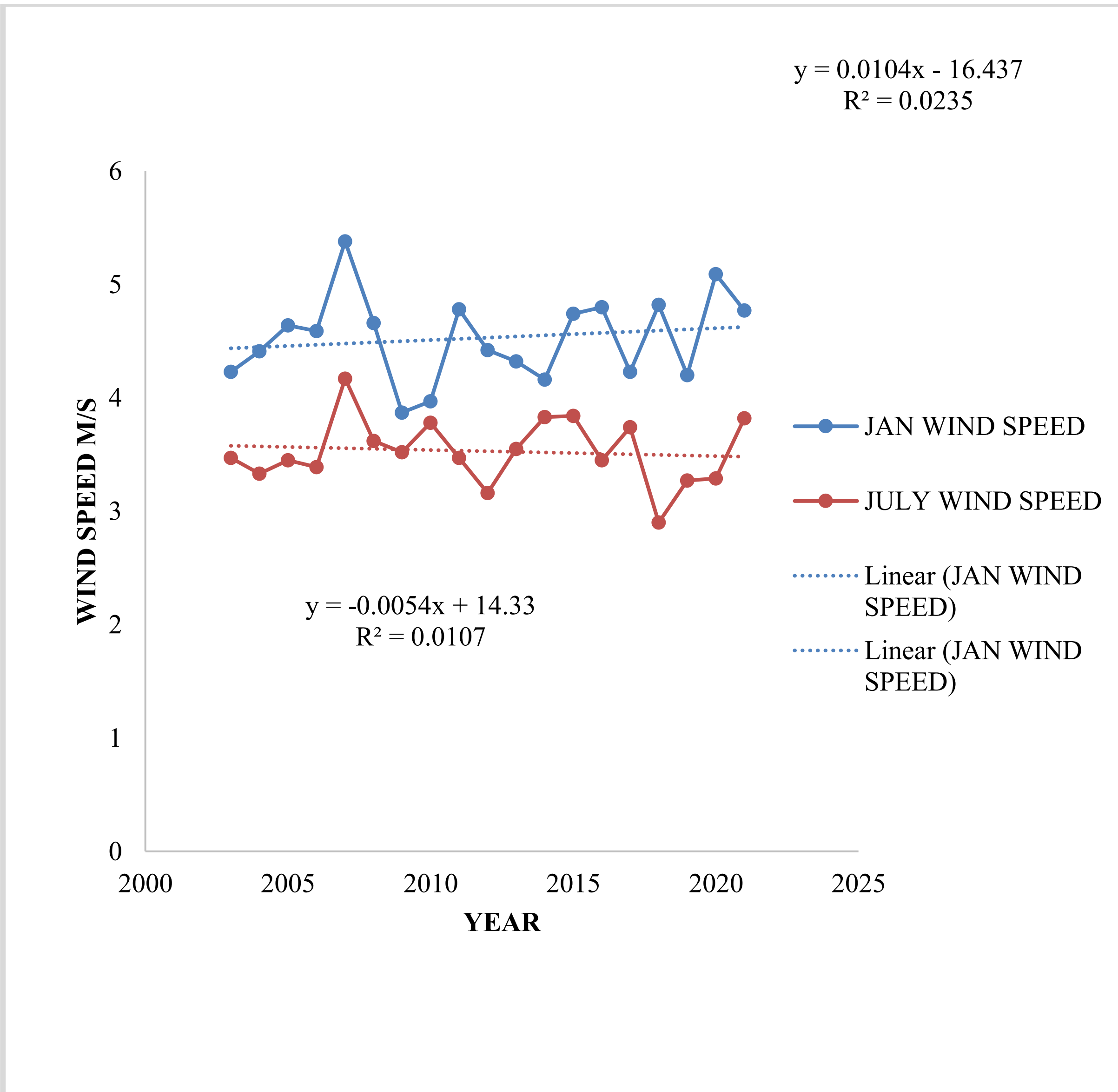

Figure 7: Seasonal Variation of Wind Speed in Maiduguri

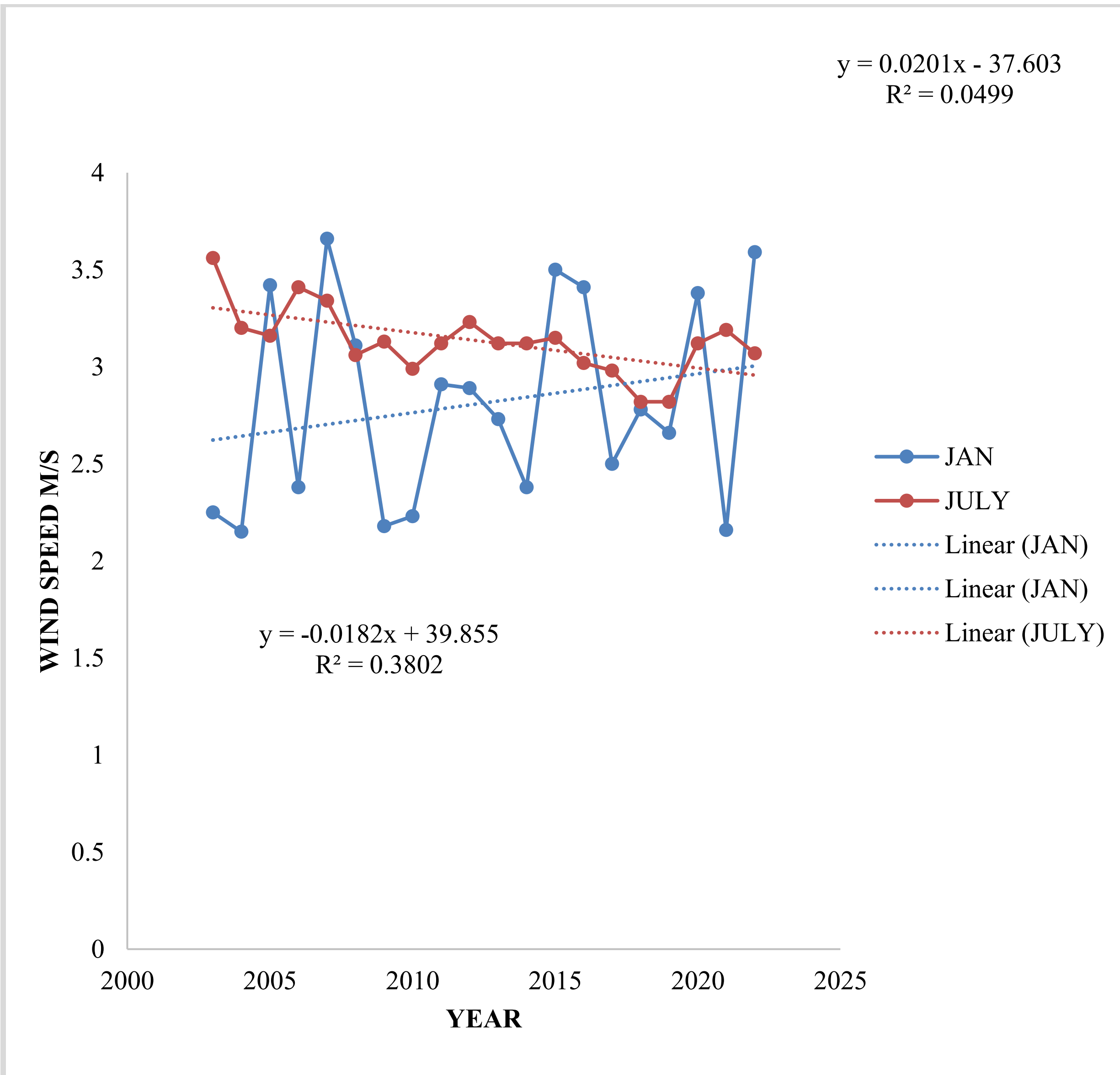

Figure 8: Seasonal Variation of Wind Speed in Enugu

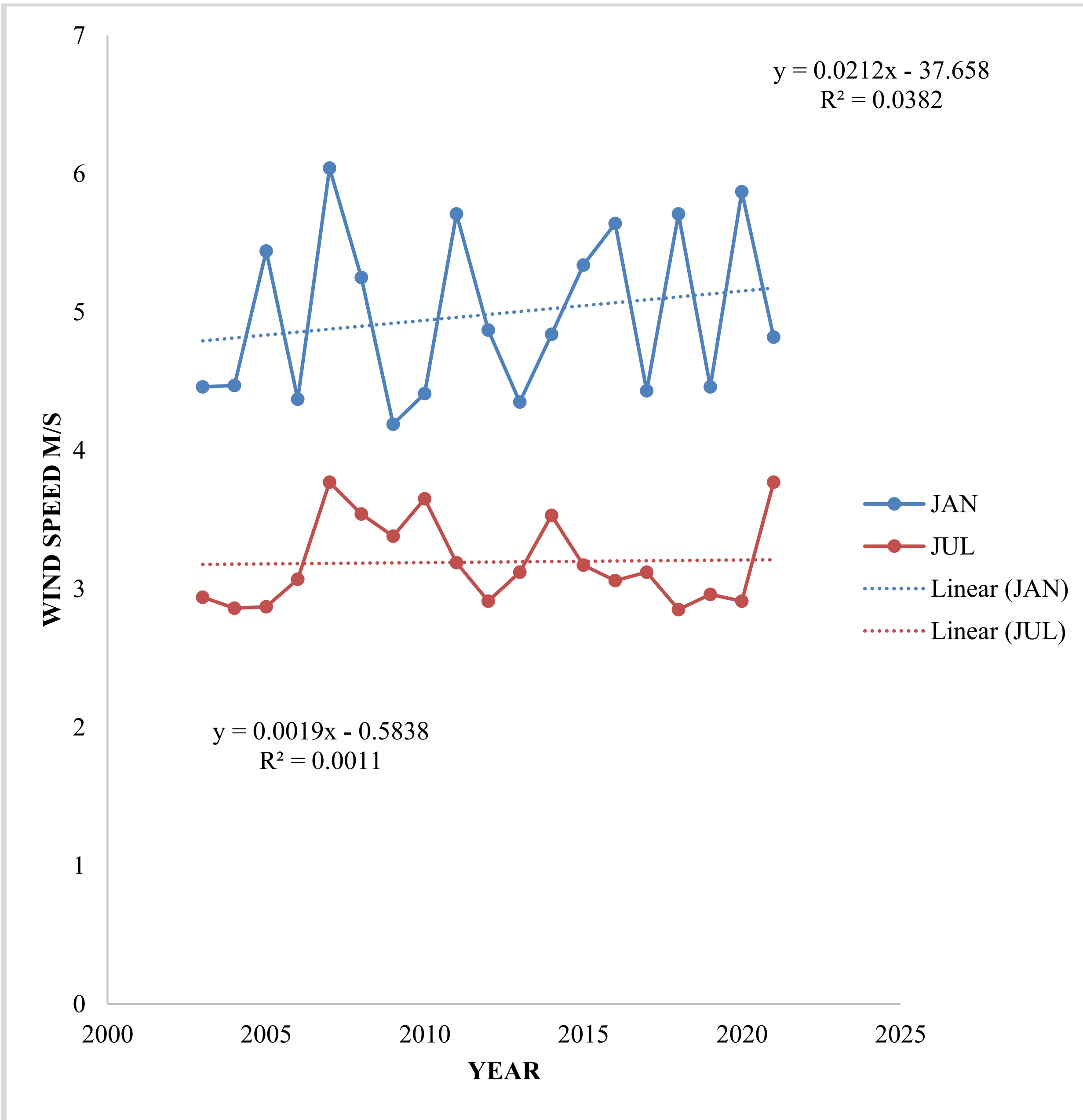

Fig 9: Seasonal Variation of Wind Speed in Katsina

Hypothesis: There is no significant relationship between Wind on UHI from 2003 to 2022.

Table 1: **Correlation Coefficient between the influence of wind speed on UHI between 2003 and 2022.**

Correlations

		Wind Speed	UHI
Wind Speed	Pearson Correlation	1	.093
	Sig. (2-tailed)		.706
	N	19	19
UHI	Pearson Correlation	.093	1
	Sig. (2-tailed)	.706	
	N	19	19

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Researcher's fieldwork 2023.

Table 1 shows the Correlation coefficient between the influence of wind speed on UHI between 2003 and 2022. The correlation coefficient of the influence of wind speed on UHI between 2003 and 2022 was insignificant at (r=.093, p<.706). This means, wind speed accounted for 0.865% of the variance in the UHI in the study area.

Discussion of Findings

The research conducted between 2003 and 2022 in various cities across Nigeria examined the relationship between wind speed and the Urban Heat Island (UHI) effect. The study provided insights into how wind patterns impact temperature variations during dry and rainy seasons in cities such as Abuja, Port Harcourt, Lagos, Jos, Kano, Katsina, and Maiduguri. This discussion aims to relate these findings to other research in the field of UHI and wind influence in different geographical locations and time frames.

Previous studies have explored the connection between wind speed and UHI in various global settings. Research by Al-Obaidi *et al*., (2021) in Australian Cities found that increased wind speeds correlated with reduced UHI intensity. This aligns with the observed trend in Port Harcourt, Nigeria, where higher dry season wind speeds were associated with a potential opportunity for UHI mitigation through strategic urban planning interventions.

Contrarily, studies by Allegrini *et al.,* (2019) conducted in European cities suggested that decreased wind speeds contributed to exacerbating UHI effects. This finding resonates with the observations in Abuja, Nigeria, where reduced wind speeds during both dry and rainy seasons could pose challenges in mitigating UHI, necessitating tailored urban planning strategies.

The mixed wind speed trends observed in Lagos during different seasons resonate with the findings of Bassett *et al.,* (2020) in coastal cities, indicating that fluctuating wind patterns can result in varying impacts on UHI intensity and, subsequently, public health. This emphasizes the importance of adaptable measures to address potential heat-related issues in such regions.

Moreover, the declining wind speeds and their implications observed in Jos, Kano, Katsina, and Maiduguri correspond to the findings of Muhammad *et al.* (2020) in arid regions, highlighting the increased energy demands for cooling systems due to reduced natural ventilation, thus emphasizing the urgency of implementing energy-efficient solutions in these areas. The findings of this research in Nigeria regarding the influence of wind speed on UHI effects align with and contribute to the existing body of knowledge on UHI in various geographical regions globally. The variations in wind speed trends observed across different seasons and cities underscore the need for tailored urban planning strategies and adaptable measures to address the potential impacts on public health and energy demands in mitigating UHI effects. Further studies incorporating a broader geographical scope and long-term observations could enhance our understanding of the intricate relationship between wind patterns and UHI dynamics across diverse urban landscapes.

4. Conclusions

This comprehensive investigation sheds light on the complex interplay between wind speed and diurnal urban heat island (UHI) dynamics across climatic belts in Nigeria. Through the integration of meteorological data collection, remote sensing analysis, and statistical regression techniques, this study has elucidated key insights into the factors influencing UHI intensity in Nigerian cities. The findings reveal that wind speed plays a nuanced role in modulating UHI patterns, with slight increases observed in UHI intensity during dry seasons and decreases during rainy seasons across selected cities in Nigeria. However, the correlation analysis suggests that the direct influence of wind speed on UHI variations is minimal, highlighting the multifaceted nature of UHI dynamics and the potential confounding effects of other meteorological variables.

Inspite the insignificant correlation, the study underscores the importance of considering wind speed as a contributing factor in UHI studies, particularly in urban planning and climate resilience efforts. By better understanding the mechanisms driving UHI dynamics, policymakers and urban planners can develop targeted strategies to mitigate heat-related risks and enhance urban livability in Nigerian cities.

Furthermore, the integration of remote sensing technology with ground-based meteorological observations demonstrates the utility of multi-disciplinary approaches in studying complex urban phenomena. Leveraging remote sensing data for spatial and temporal analysis provides valuable insights into urban environmental processes, facilitating evidence-based decision-making for sustainable urban development.

In conclusion, this study contributes to the growing body of knowledge on UHI dynamics in Nigeria and emphasizes the need for continued research to unravel the intricate interactions between meteorological factors, land use patterns, and urban microclimates. By advancing our understanding of UHI dynamics, we can better adapt to the challenges of urbanization and climate change, ultimately fostering more resilient and sustainable cities in Nigeria and beyond.

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