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FOREWORD

It is with great delight and utmost gratitude I welcome our readers, scientific audience and researchers' community to volume 5 issue 1 of Federal Polytechnic Ilaro – Journal of Pure and Applied Sciences (FEPI-JOPAS). This is a peer-reviewed and accredited multi-disciplinary Journal of international repute that is indexed in AJOL and other Data Bases. It publishes short communication, full-length research work, critical reviews, and other review articles. FEPI-JOPAS aims at providing intellectual bedrock for both indigenous and international scholars with impactful research work to communicate and disseminate their findings to a broader populace for better contribution to knowledge. It archives and unveils research information to 21st Century researchers, professionals, policymakers, manufacturers, production staff, R & D personnel as well as governmental and non-governmental agencies.

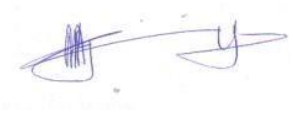
In this particular issue, Oderinde and Diagboya evaluated the competitive adsorption of Cd, Cr, Pb, Cu and Zn from two laterite samples and their finding showed that remediation of the three metals from industrial waste effluents can be successfully achieved. The work of Agbolade and Akinode, dealt with the simulation of composite waste management method for the enhancement of agricultural yield for food security. Adewunmi and Agwo examined dietary patterns, alcohol intake, and nutritional status of commercial drivers at different motor parks in Oshodi Lagos state, and recommended that Government should introduce a nutrition mentoring program for all drivers. A purposive sampling method was adopted by Sodiya for the assessment of the effects of illegal motor parks in the study area which is necessitated due to the manifestation of various environmental menaces.

Furthermore, the finding from Dawodu and Sholanke revealed that the majority of polytechnic residents have a tendency to routinely engage in recreational activities, with most of them doing so at least three times each week. According to Oduwole and Areh, stratified random sampling was utilized to examine Nigerian surveyors' attitudes and perceptions on the ease of use and usefulness of technological innovation, while Mathew and Jayeoba developed a microcontroller-based BMI machine for automatic, accurate, interactive monitoring means of human health. Also, Adetona addressed the destruction of the environment in the Lagos megacity through sustainable landscaping,

Finally, I deeply appreciate the well commendable efforts of the esteemed Editorial Board members, the Reviewers, and the Authors for their valuable contributions towards the effective and enriching production of this edition. It is imperative to know that authors are solely responsible for the information, data, and authenticity of data provided in their articles submitted for publication in the Federal Polytechnic Ilaro – Journal of Pure and Applied Sciences (FEPI-JOPAS).

I am looking forward to receiving your manuscripts for subsequent publications. You can visit our website https://fepi-jopas.federalpolyilaro.edu.ng for more information, or contact us via e-mail at fepi.jopas@federalpolyilaro.edu.ng

Thank you and best regards.



Prof. Olayinka O. AJANI

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Experimental

SORPTION OF COMPETING HEAVY METALS ON LATERITE

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ABSTRACT

Heavy metal pollution is a major concern for environmentalists. Competing ions affect the sorption of heavy metals onto the surfaces of soils. This study evaluated competitive adsorption of Cd, Cr, Pb, Cu and Zn from two laterite samples – Emuhu Laterite, LAEM and Abeokuta Laterite, LAAB, obtained from Nigeria. The equilibrium concentrations of heavy metals following adsorption using mixed metal solutions were determined. Laterite affinities for heavy metal adsorption were determined by means of selectivity sequences. The adsorption sequences obtained were Cu > Pb > Cr > Zn > Cd and Cu > Cr > Pb ≫ Zn > Cd for LAEM and LAAB, respectively. Cr, Pb, Cu were strongly adsorbed by both soils. Adsorptions of the heavy metals on LAEM and LAAB fitted into the Freundlich and Langmuir isotherm model, respectively. The results suggested that Emuhu Laterite, LAEM and Abeokuta Laterite, LAAB, can receive and hold Cr, Pb and Cu pollutants in solution. They can thus be recommended for remediation of the three metals from industrial waste effluents.

Key Words: Competition, isotherms, remediation, selectivity, soils, toxicity

1.0 INTRODUCTION

Many anthropogenic activities such as industrial wastewater discharge, agricultural fertilizers, and mining leaching, introduce heavy metals into the water body (Huang et al., 2019). These metal ions are of concern to public health and the environment if inappropriately discharged (Laus, Costa, Szpoganicz & Favere, 2010) because they are bio-accumulative and may enter into the human food chain with consequential health difficulties. The potential sources of heavy metal ions in wastewaters are diverse (Tekin & Acikel, 2023). Removal of heavy metals from industrial wastewater is therefore of primary importance. To mitigate the heavy metal pollution, several methods have evolved over the years. A number of deficiencies are associated with conventional methods of treatment including but not limited to high operational costs, excessive sludge yields to be disposed-off, and poor usability (Bhatnagar & Silanpaa, 2010). For economy, effectiveness and reduction of the deficiencies of conventional methods for the removal of metals from wastewaters, new separation methods are developed. Adsorption as a treatment process, has attracted considerable interest and appears to be the most widely used. It is a user-friendly technique and seems to be most versatile and effective if combined with appropriate regeneration steps. Most favoured adsorbents are those that are abundant, cheap, and widely available and are environmentally friendly (Montalescot et al., 2015). Naturally occuring materials therefore, are of interest with agricultural products that have no food value being the most prominent (Bayuo, Rwiza, Sillanpaa & Mtei, 2023). Despite the over-whelming advocacy and use of the agricultural wastes as adsorbents, they are not without disadvantages. The adsorption capacities of untreated agricultural wastes are low, their chemical oxygen demand, biochemical oxygen demand and total organic carbon are high (Nakajima & Sakaguchi, 1990). Plant wastes require modification for suitability in the removal of heavy metals.

Laterite is a wide variety of red, brown, and yellow, fined grained residual soils of light texture as well as nodular gravels and cemented soils, which gathers on the surface of rocks from which it is produced by decomposition and is common in the tropical regions. Fe and/or Al like-containing natural materials such as raw laterite, siderite and hematite, are getting pronounced these days. A naturally occurring and abundant clay, raw laterite, is been studied widely (Maiti, Basu, & De, 2012).

Being a naturally abundant, cheap, and environmentally friendly material, its suitability for use for heavy metal remediation cannot be overemphasised. From literature search, adsorption studies using laterite have involved single-component metal ions simulated wastewater. Industrial wastewater effluents however, are multicomponent systems with competing metal ions. The objective of this study therefore, was to evaluate competitive adsorption of Cd, Cr, Pb, Cu and Zn ions from two laterite samples obtained from Nigeria.

2.0 MATERIALS AND METHODS

Laterite Sampling and Pre-treatment

Laterite was obtained in the month of November from the non-vegetative region (30-50cm) of a laterite site at Oke-Imosan, (Lat. 7^o 7' 0N, Long. 3^o 22' 0E) Abeokuta, Ogun State and Emuhu (Lat. 6^o 16' 19N, Long. 6^o 15' 44E), Ika South LGA of Delta State using a soil auger. They were separately collected in polythene bags and labelled for ease of identification as LAAB and LAEM, to represent laterite from Abeokuta and Emuhu, respectively. The laterite samples were dried for 72 h, ground and screened with a 1.0 mm mesh and stored for analysis.

Soil Physicochemical Parameters

The methods of Rice, Baird, and Eaton (2017) and Sparks et al. (1996) were used to determine the physicochemical properties of laterite samples. Laterite pH and electrical conductivity (EC) were determined using 40% soil suspension in deionised water with a Jenway 3540 pH-Conductivity meter. The micro Kjeldahl method was used for total nitrogen (TN) content of soils determination. The ascorbic acid method was used for soil phosphorus content determination at 885 nm using UV-visible spectrophotometer (Jenway, 6300). Acid ammonium fluoride extraction method was used for the determination of laterite extractable phosphorus (P). Ammonium acetate (pH 7) was used to measure exchangeable cations (K, Na, Ca and Mg). K and Na were determined using flame atomic emission method. Complexometric titration using EDTA was used for laterite exchangeable Ca and Mg determination. Particle size distribution determination was done by the hydrometer method. The metal oxides were determined using X–ray Fluorescence Spectrometer Model ARL-9900, OASIS at 40kV, 30mA.

Competitive Adsorption

The method of Bassam et al. (2022) was used for the adsorption capacities of the laterite samples determination. The results of experiments were used for the calculation of each metal adsorption distribution coefficients in each soil using

Eqn 1:

$$\boldsymbol{K_d = \frac{q_e}{C_e}} \quad (1)$$

K_d = the Distribution Coefficient,

q_e = amount of metal adsorbed by laterite (mg/g)

C_e = the amount of metal unadsorbed in solution at equilibrium (mg/L).

Sorption data were characterised by the Langmuir and Freundlich isotherm models. For the linear form of the Langmuir model, plots of C_e/q_e against C_e were made using Eqn 2.

$$\frac{C_e}{q_e} = \frac{C_e}{q_m} + \frac{1}{Kq_m} \quad (2)$$

Where q_e is the amount of metal adsorbed by laterite (mg/g),

q_m = the maximum adsorption capacity of adsorbent (mg/g),

K = the equilibrium constant of Langmuir Isotherm (mg/g),

C_e = the amount of metal unadsorbed in solution at equilibrium (mg/L).

For the Freundlich models, plots of log q_e against log C_e were made using the linearised Eqn 3

$$log\ q_e = log\ K_F + 1/n\ log\ C_e \quad (3)$$

Where q_e is the amount of metal adsorbed by laterite (mg/g), C_e is the amount of metal unadsorbed in solution at equilibrium (mg/L), K_F is the mono-component constant of Freundlich isotherm of the single-component (mg/g) and n is the mono-component

Freundlich heterogeneity factor of the single component.

Statistical Analyses

All determinations were done in duplicates. The mean values of all determinations and all other statistical analyses were performed using SigmaPlot 14 (Systat Inc).

3.0 RESULTS AND DISCUSSION

The results of the physicochemical analyses of laterite samples are presented in Table 1. The physicochemical analyses revealed that the two soils studied, Abeokuta laterite (LAAB) and Emuhu laterite (LAEM), had pH values in the acidic range. The pH of LAAB in deionised water and KCl solution were 4.5 and 3.8 while those of LAEM were 5.3 and 4.6, respectively. Both soils had a ΔpH ($pH_{KCL} - pH_{H2O}$) value of -0.7. This implied that both soils slight negative charge at the equilibrium pH (Cazanga et al., 2008). This suggested that H^+ on the soils were replaced by metal ions in solution. Soil pH affects heavy metals availability in soil. When pH is around 6.5 – 7, metal ions are relatively unavailable in solution. Precipitation of metal elements will increase due to the formation of hydroxides, carbonates and organic complexes thereby reducing mobility (Antoniadis, Tsadilas & Ashworth, 2007). With the low pH value of the soil, heavy metal mobility will be high and metal availability may be low. The organic matter and thus the organic carbon contents of the soils were low – 0.1% and 0.6%, respectively, in LAAB and 1.5 x 10^{-3}% and 0.09%, respectively, in LAEM. With the low values, the soils are not expected to support vegetation and would be expected to have low sorption abilities for metals. The cation exchange capacity, CEC, of both soils reflected the low organic matter contents. CEC values of 3.82 (meq/100g) and 4.12 (meq/100g) were obtained for LAAB and LAEM, respectively. The order of decrease in exchangeable bases contents were in the order Ca > Na > Mg > K in both soils. Calcium, the dominant exchangeable base in both soils, accounted for 27.75% and 30.10% of CEC in LAAB and LAEM, respectively. Although, LAEM had a lower organic matter than LAAB, its higher CEC may be attributed to the clay content which was 38.1%, an order of 15.3% greater than the 22.8% recorded for LAAB. Higher sand contents of 71.20% and 55.20% were recorded for LAAB and LAEM, respectively. The silt contents of the two soils were however the same, 6.00%.

The initial desorption studies on the soil samples using the background electrolyte showed that no significant amounts of heavy metals were desorbed from the laterites. The data obtained in the adsorption experiments were not affected by presumed heavy metal likely to be leached from the laterite.

The equilibrium concentrations, Ec, and the quantity of metal cations adsorbed in the supernatant after adsorption experiment are presented in Table 2. Both soils followed a general trend. Cr, Pb and Cu showed relatively low Ec at the concentrations of application. The implication was a higher soil surface affinity by the metals Cr, Pb and Cu while Cd and Zn had low affinities for the surfaces. An irregular trend in the amounts of metal cation adsorbed was observed as the concentrations of applied metal cations increased. However, the higher values observed for Cr, Pb and Cu were maintained. The behaviour may be attributed to the type of metal-surface interaction (Qasem, Mohammed, & Lawal, 2021). The retention of Zn and Cd is more of covalent bonding with the laterite structures. Similar results were obtained by Gomes et al. (2001), that concurrent competition usually favour Cr, Pb and Cu, in soils than Zn, Cd and Ni.

Considering the fact that the metals were added in equal mass rather than equimolar amounts, a possible bias is introduced in the comparison of the metals (Gomes et al., 2001). The sorption affinity between the metal cation and the mineral surfaces can therefore be calculated as the amount of each metal present in the adsorption complex, i.e., the share of a given metal in the total amount adsorbed by the soil (Table 3) mineral matrix expressed as percent.

Table 1: Physicochemical properties of Abeokuta and Emuhu laterites*

Parameters	LAAB	LAEM
pH		
In water	4.5	5.3
In KCl	3.8	4.6
Organic matter (%)	0.10	1.5×10^{-3}
Organic carbon (%)	0.60	0.09
Total nitrogen (%)	0.15	0.02
Exchangeable bases (mg/100g) -		
Ca	1.06	1.24
Mg	0.57	0.54
Na	0.75	0.87
K	0.04	0.07
Exchangeable acidity (meq/100g)	1.40	1.40
Cation Exchange capacity (meq/100g)	3.82	4.12
Base saturation (%)	63.35	66.02
Particle size distribution (%)		
Sand	71.20	55.20
Silt	6.00	6.00
Clay	22.8	38.1
Exchangeable micronutrients (mg/kg)		
Cu	0.60	0.95
Zn	1.19	1.37
Mn	1.60	2.30
Fe	11.20	20.20
SiO_2 (%)	70.33	67.70
Al_2O_3 (%)	17.58	17.20
Fe_2O_3 (%)	5.91	6.10
CaO (%)	2.46	1.75
MgO (%)	1.37	1.23
Na_2O (%)	0.02	0.02
K_2O (%)	0.29	0.35
SO_3 (%)	0.04	0.03
Silica Ratio (%)	2.99	2.91
Aluminium Ratio (%)	2.98	2.82
$CaCO_3$	4.4	3.12

* Values are mean of duplicate determinations

Table 2: Equilibrium concentration (Ec (mg/L)) and adsorbed metal cation (Ads (mg/g)) from the Solution

Soil	Concentration Added (mg/L)	Metal Cation									
		Cd		**Cr**		**Pb**		**Cu**		**Zn**	
		Ec (mg/L)	Ads (mg/g)	Ec (mg/L)	Ads (mg/g)	Ec (mg/L)	Ads (mg/g)	Ec (mg/L)	Ads (mg/g)	Ec (mg/L)	Ads (mg/g)
LAEM	100	97.25	0.03	39.24	0.61	55.60	0.44	64.13	0.36	83.63	0.16
	200	198.50	0.02	131.93	0.69	130.00	0.70	82.63	1.17	193.25	0.07
	300	296.75	0.03	232.25	0.68	191.00	1.09	194.63	1.05	288.00	0.12
	400	391.40	0.09	330.80	0.69	266.00	1.34	222.25	1.78	319.88	0.80
	500	482.50	0.18	413.50	0.87	345.00	1.55	352.1	1.48	467.38	0.33
	Total		**0.34**		**3.53**		**5.12**		**5.84**		**1.48**
LAAB	100	98.25	0.02	34.64	0.65	59.45	0.41	69.13	0.31	86.93	0.13
	200	195.75	0.04	142.75	0.57	138.70	0.61	79.63	1.20	189.50	0.11
	300	294.00	0.06	223.80	0.76	164.50	1.36	169.50	1.31	282.75	0.17
	400	394.75	0.05	320.95	0.79	263.50	1.37	220.75	1.79	327.63	0.72
	500	492.50	0.08	428.88	0.71	391.75	1.08	440.88	0.59	476.00	0.24
	Total		**0.25**		**3.49**		**4.82**		**5.20**		**1.37**

Table 3: Sum and percentage metal cation adsorbed in the adsorption complex.

Soils	Sum of Metal Adsorbed (mg/g)	Metal Cations (%)				
		Cd	Cr	Pb	Cu	Zn
ADSORPTION						
LAEM	**1.60**	1.72	37.94	27.72	22.40	10.23
	2.64	0.57	26.02	26.47	44.39	2.56
	2.97	1.09	22.78	36.65	35.44	4.04
	4.70	1.83	14.74	28.53	37.85	17.06
	4.40	3.98	19.68	35.27	33.65	7.42
LAAB	**1.52**	1.15	43.11	26.75	20.37	8.63
	2.54	1.68	22.57	24.16	47.45	4.14
	3.65	1.64	20.85	37.08	35.71	4.72
	4.72	1.11	16.73	28.89	37.94	15.32
	2.70	2.78	26.34	40.09	21.90	8.89

At 100 mg/L, the amount of metals ion sorbed decreased in order of increasing atomic masses except for Pb. Cr, occupying 37.94% and 43.11% of the adsorption complex in LAEM and LAAB, respectively. Increase in concentration led to increase in competition, with the amount of Cr, Cu and Pb adsorbed higher compared with Cd and Zn. Adsorption increased sharply at the various concentrations of mixed cations added up to 400mg/L. Thereafter, a sharp decline was observed in adsorption. Decrease in sorption after initial increase was in line with the studies of Vega, Covelo, and Andrade (2006). Tables 4 summarises the results of the Langmuir and Freundlich isotherms as related to the adsorption studies. The competitive adsorptions of heavy metals on LAEM fitted well into the Freundlich isotherm model with the correlations in the range 0.56 – 1.00 while LAAB had 60% fitting into the Langmuir isotherm model with correlations in the range 0.66 – 0.98. The adsorption intensity, n (g/L), and capacity, K_F (mg/g) for LAEM was of the order Cr > Cu > Pb > Zn > Cd. For LAAB, the maximum adsorption equilibrium constant, q_m (mg/g), was highest for Pb followed by Cr, Cu, Zn and Cd in that order which was similar to the observations of Vega et al. (2006). These values suggest ease of displacement of Zn and Cd relative to Cr, Pb and Cu. In the desorption studies, the best isotherm model was the Langmuir model. Correlations for Pb and Cr were highest in LAEM and LAAB, respectively. The isotherm models for both adsorption and desorption studies however, generally had poor correlations.

Tables 5 shows that relatively large amount of Cr, Cu and Pb were adsorbed compared with Zn and Cd. The use of distribution coefficient, K_d is necessitated by the irregular isotherms due to heavy metals competition and poor fitting with the Langmuir and Freundlich equations, (Gomes et al., 2001). The higher the K_d value, the stronger the sorption of the metal to the solid phase while the lower the K_d value, the larger the fraction of metal ions in solution (Anderson & Christensen, 1988). K_d values are therefore indices of metal mobility and retention (Antoniadis & Tsadilas, 2007). Adsorption of Cu, Pb and Cr had the highest values of K_d for both soils similar to the observations of Gomes et al. (2001) and Vega et al. (2006). These showed that they were the cations most retained and in general, Cu was strongly retained than Cr and Pb which exchanged positions for LAEM and LAAB. Zn and Cd had the lowest K_d values with the implication that, Cu, Pb and Cr easily replaced them when competing. This reasoning is in line with the findings of Gomes et al. (2001) and Vega et al. (2006). For the two soils Cr however, was strongly retained than Pb and Cu. The adsorption sequences obtained were Cu > Pb > Cr > Zn > Cd and Cu > Cr > Pb ≫ Zn > Cd for LAEM and LAAB, respectively. The results strongly suggest that sorption of Cd and Zn onto the laterite samples will be of concern than Cu, Cr and Pb.

Table 4 Langmuir and Freundlich Isotherm Parameters for Competitive Adsorption on LAEM and LAAB.

Soil	Metal	Langmuir			Freundlich			Best-Fitting Model
		K_L (mg/g)	q_m (mg/g)	R^2	K_F (mg/g)	n (g/L)	R^2	
ADSORPTION								
	Cd	-0.001	-0.098	0.12	7.87×10^{-05}	0.871	0.56	Freundlich
LAEM								
	Cr	0.03	0.846	0.95	0.402	9.267	0.62	Langmuir
	Pb	0.002	3.420	0.84	0.025	1.406	0.98	Freundlich
	Cu	0.003	2.885	0.40	0.037	1.505	0.58	Freundlich
	Zn	2.4×10^{-4}	2.975	0.00	0.010	1.000	1.00	Freundlich
	Cd							Freundlich
LAAB		0.001	0.204	0.41	4.3×10^{-4}	1.194	0.90	
	Cr	0.067	0.764	0.98	0.491	14.970	0.26	Langmuir
	Pb	0.007	1.675	0.66	0.038	1.644	0.65	Langmuir
	Cu	-0.028	0.622	0.76	0.290	4.568	0.06	Langmuir
	Zn	0.003	0.500	0.18	0.006	1.541	0.31	Freundlich

Table 5 Metal ions distribution coefficients after adsorption and selectivity sequences

Soil	Metals					Selectivity Sequence
	Cd	Cr	Pb	Cu	Zn	
ADSORPTION						
LAEM	0.28	15.5	7.99	5.59	1.96	
	0.08	5.21	5.38	14.20	0.35	
	0.11	2.92	5.71	5.41	0.42	
	0.22	2.09	5.04	8.00	2.51	
	0.36	2.09	4.49	4.20	0.70	
Total	**1.05**	**27.80**	**28.60**	**37.40**	**5.93**	Cu > Pb > Cr > Zn > Cd
LAAB	0.18	18.9	6.82	4.47	1.5	
	0.22	4.01	4.42	15.10	0.55	
	0.20	3.40	8.24	7.70	0.61	
	0.13	2.46	5.18	8.12	2.21	
	0.15	1.66	2.76	1.34	0.50	
Total	**0.88**	**30.40**	**27.40**	**36.70**	**5.38**	Cu > Cr > Pb ≫ Zn > Cd

4.0 CONCLUSION

The laterites from Emuhu, Delta State (LAEM) and Abeokuta, Ogun State (LAAB) were acidic, low in organic matter and CEC with the consequences of being non-supportive of vegetation. The trends of adsorption observed for the two laterite samples were the same. As the concentration of metal cation in mixed solution increased, the proportion of Cr, Cu and Pb adsorbed by the soils increased relative to Zn and Cd. The competitive adsorptions of the heavy metals on LAEM fitted well into the Freundlich isotherm model while LAAB had 60% fitting into the Langmuir isotherm model. The adsorption intensity suggested ease of displacement of Zn and Cd relative to Cr, Pb and Cu from adsorbent. K_d values which are indices of metal mobility and retention gave adsorption sequences being Cu > Pb > Cr > Zn > Cd and Cu > Cr > Pb ≫ Zn > Cd for LAEM and LAAB, respectively. In immobilising mixed cations in soils, laterite will serve in the retaining Cr, Pb and Cu better than Zn and Cd. LAEM however, has better potentials than LAAB.

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SIMULATION OF COMPOSITE WASTE MANAGEMENT METHOD FOR THE ENHANCEMENT OF AGRICULTURAL YIELD

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Abstracts
The increasing amount of organic waste generated globally has prompted research into more sustainable waste management practices. One promising approach is to use waste composting to convert organic waste into nutrient-rich soil that can be used to enhance agricultural yield. This paper explores the simulation of waste composting as a means of optimizing the composting process and improving agricultural yield. Through computer modeling, various composting scenarios can be evaluated, such as the effect of different types and quantities of organic waste, temperature, moisture, and aeration on the final compost quality. The results of these simulations can be used to identify the optimal conditions for composting, which can then be applied in practice to produce high-quality compost. By utilizing waste composting for agricultural purposes, we can promote sustainable waste management practices, reduce greenhouse gas emissions, and increase crop yields, leading to a more sustainable and food-secure future.

Keywords: Composting, modeling, organic waste, simulation

INTRODUCTION

According to the Food and Agriculture Organization of the United Nations (FAO), agricultural productivity needs to increase by 70% to meet the food demand of the world's population by 2050 (FAO, 2021). One potential solution to increase agricultural productivity is through the use of waste composites as soil amendments. Waste composites are materials composed of waste products from different industries, which can be repurposed for agriculture. These materials are rich in organic matter, nutrients, and other beneficial compounds, which can enhance soil health and promote plant growth.

Agriculture is the backbone of the world's economy and is responsible for providing food and other essential resources to humanity. However, conventional agricultural practices can have negative environmental impacts, such as soil degradation and water pollution. Therefore, sustainable agricultural practices, such as the use of waste composites as soil amendments, are gaining increasing attention as a means to enhance agricultural productivity while minimizing environmental impacts.

Waste composites are materials composed of waste products from different industries, which can be repurposed for agricultural use. They are rich in organic matter, nutrients, and other beneficial compounds, which can enhance soil health and promote plant growth. The use of waste composites as soil amendments can provide numerous benefits to soil and plant health, including improving soil structure, increasing soil fertility, and reducing nutrient losses.

The application of waste composites in agriculture has been extensively studied in recent years. Various researchers have investigated the effects of different types of waste composites on soil and plant health, as well as their application rates and timing. These studies have demonstrated the potential of waste composites as an effective soil amendment for enhancing agricultural productivity.

Overall, the use of waste composites as soil amendments has significant potential to enhance agricultural yield and contribute to sustainable agriculture. As such, further research is needed to fully understand the mechanisms behind the benefits of waste composites and optimize their formulations for different agricultural applications.

There are several simulation studies that have been conducted on waste composite disposal. Here are some examples:

Landfill simulation studies: These studies model the behavior of waste composites in landfills and their impact on the environment. For example, one study used a simulation model to investigate the behavior of municipal solid waste in a landfill and predict the production of landfill gas (Ouda et al., 2019).

Composting simulation studies: These studies simulate the composting process to predict the quality and nutrient content of the resulting compost.

For example, one study used a simulation model to investigate the effects of different carbon-to-nitrogen ratios on the composting process and the quality of the resulting compost (Djemel et al., 2020).

Anaerobic digestion simulation studies: These studies simulate the anaerobic digestion process to predict the production of biogas and the nutrient content of the resulting di-gestate. For example, one study used a simulation model to investigate the effects of temperature and hydraulic retention time on the anaerobic digestion of food waste and the production of biogas (Song et al., 2020).

Life cycle assessment simulation studies: These studies simulate the entire life cycle of waste composites, from production to disposal, to predict their environmental impact. For example, one study used a life cycle assessment model to investigate the environmental impact of using waste cooking oil as a feedstock for biodiesel production (Nguyen et al., 2020).

Soil simulation studies: These studies simulate the behavior of waste composites in soil and their impact on soil quality and plant growth. For example, one study used a simulation model to investigate the effects of different types of waste composts on soil organic carbon content and plant growth (He et al., 2019).

It is obvious that, simulation studies provide valuable insights into the behavior and impact of waste composites on the environment and can inform the development of sustainable waste management practices. These studies can also help optimize the use of waste composites for different applications, such as soil amendment or biogas production.

Matlab is a widely used programming language for conducting simulations in many fields, including waste management. In waste composting, Matlab can be used to develop models that simulate the process and predict the quality and nutrient content of the resulting compost. For example, one study used Matlab to develop a simulation model that predicts the moisture content and pH value of the compost during the composting process (Han et al., 2018). Another study used Matlab to develop a simulation model that predicts the temperature and oxygen content of the compost pile and optimizes the aeration rate to improve the composting process (Singh et al., 2019).

Matlab can also be used to simulate the anaerobic digestion process, which is a common method for treating organic waste. For example, one study used Matlab to develop a simulation model that predicts the production of biogas and the nutrient content of the resulting di-gestate during the anaerobic digestion of food waste (Zhu et al., 2018).

Thus, Matlab simulations can provide valuable insights into the waste composting and anaerobic digestion processes and help optimize the conditions for maximum efficiency and nutrient recovery.

The composite model

The model equation for composting process that includes the aerobic and anaerobic decomposition of organic matter, nitrification, and de-nitrification are defined as follow:

$$\frac{dC}{dt} = -\frac{K_1 CO_2}{K_s+O_2} - K_2 C(1-\theta) + \frac{K_3 NH_4(1-\theta)}{K_n+NH_4} d \frac{K_4 NO_3(1-\theta)}{K_s+NO_3} \quad (1)$$

$$\frac{d\theta}{dt} = Q\frac{1-\theta}{\theta*3600} \quad (2)$$

$$\frac{dO_2}{dt} = -\frac{K_1 CO_2}{Ks+O_2} + Q\frac{21-O_2}{\theta*3600} \quad (3)$$

$$\frac{dNO_3}{dt} = \frac{K_3 NH_4(1-\theta)}{K_n+NH_4} - \frac{K_4 NO_3(1-\theta)}{K_d+NO_3} \quad (4)$$

$$\frac{dNH_4}{dt} = -\frac{K_3 NH_4(1-\theta)}{K_n+NH_4} + K_2 C(1-\theta) \quad (5)$$

where:

C = concentration of organic matter (g/L), θ = porosity of compost pile, O_2 = concentration of oxygen (vol/vol), NO_3 = concentration of nitrate (g/L), NH_4 = concentration of ammonium (g/L), K_1 = rate constant for aerobic decomposition of organic matter, K_2 = rate constant for anaerobic decomposition of organic matter, K_3 = rate constant for nitrification, K_4 = rate constant for de-nitrification, Ks = half-saturation constant for aerobic decomposition, K_n = half-saturation constant for nitrification, K_d = half-saturation constant for de-nitrification, and Q = flow rate of air through compost pile

Equation 1 represents the rate of change of the concentration of organic matter (C) in the compost pile over time. It depends on four different processes: aerobic decomposition, anaerobic decomposition, nitrification, and de-nitrification. The first term represents the rate of aerobic decomposition, where the concentration of oxygen (O_2) affects the rate of decomposition according to the half-saturation constant Ks. The second term represents the rate of anaerobic decomposition, where the absence of oxygen $(1-\theta)$affects the rate of decomposition. The third term represents the rate of nitrification, where the concentration of ammonium (NH_4) affects the rate of nitrification according to the half-saturation constant Kn. The fourth term represents the rate of de-nitrification, where the concentration of nitrate (NO_3) affects the rate of de-nitrification according to the half-saturation constant, K_d.

Equation 2 represents the rate of change of porosity (theta) in the compost pile over time. It depends on the flow rate of air through the pile (Q) and the current porosity value $(1-\theta)$ at each time step. The factor of 3600 is used to convert the flow rate of air (Q) from the units of liters per second to the units of liters per hour. This is because the porosity (theta) and the oxygen concentration (O_2) are defined in terms of the volume of air in the compost pile per unit volume of compost, and the rate of change of oxygen concentration $(\mathrm{d}O_2dt)$ is defined in terms of the change in oxygen concentration per unit time. Therefore, to ensure that the units are consistent, the flow rate of air is converted from liters per second to liters per hour by multiplying by 3600.

Equation 3 represents the rate of change of oxygen concentration (O_2) in the compost pile over time. It depends on two different processes: aerobic decomposition and air flow. The first term represents the rate of oxygen consumption during aerobic decomposition, and the second term represents the rate of oxygen replenishment due to air flow.

Equation 4 represents the rate of change of nitrate concentration (NO_3) in the compost pile over time. It depends on two different processes: nitrification and de-nitrification. The first term represents the rate of nitrate production due to nitrification, and the second term represents the rate of nitrate consumption due to de-nitrification.

Equation 5 represents the rate of change of ammonium concentration (NH_4) in the compost pile over time. It depends on two different processes: nitrification and anaerobic decomposition. The first term represents the rate of ammonium consumption due to nitrification, and the second term represents the rate of ammonium production due to anaerobic decomposition.

The differential equations describe the rates of change of each variable over time, based on the given parameters and initial conditions. They are solved numerically using the ode45 solver in MATLAB to simulate the composting process.

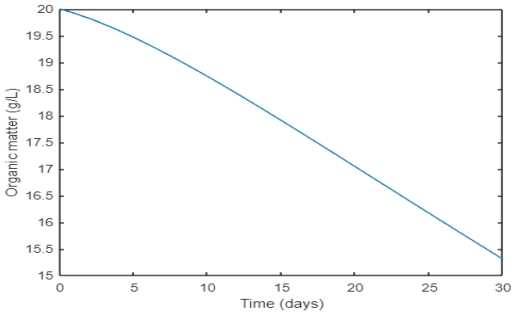

Figure1: Concentration of organic matter

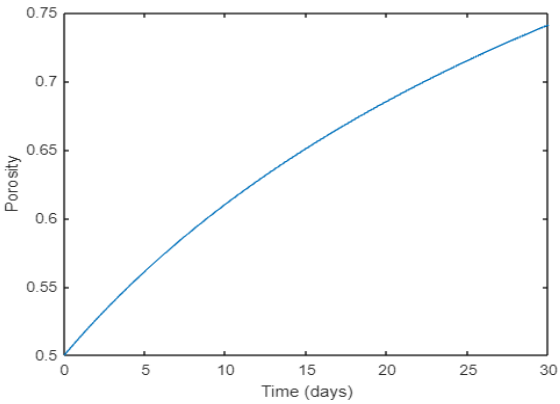

Figure2: Porosity of the compost pile

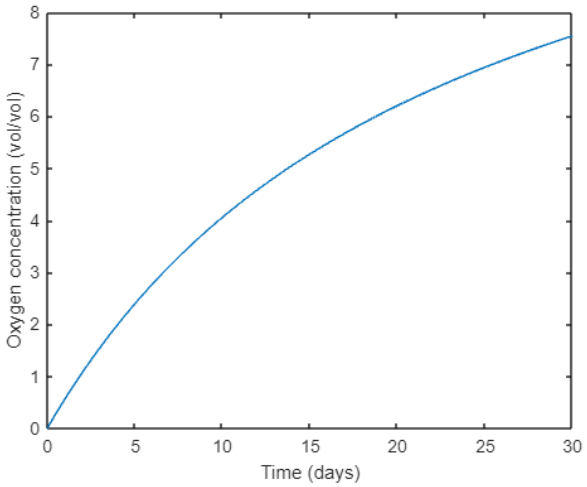

Figure 3: Concentration of O_2 in the comp. pile

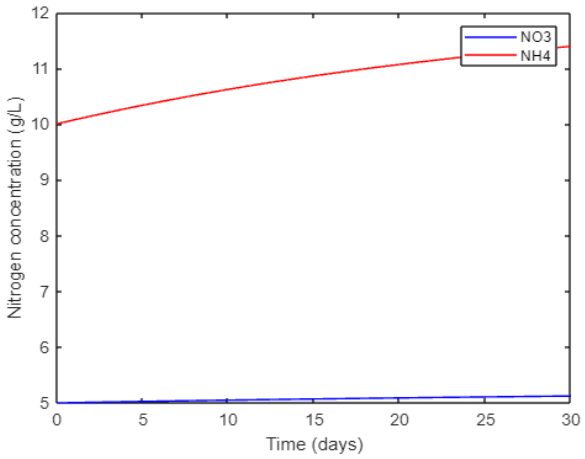

Figure 4: Concentration of N in the comp. pile

The model simulates the composting process, which includes the aerobic and anaerobic decomposition of organic matter, nitrification, and de-nitrification. The model takes into account the concentrations of organic matter, porosity, oxygen, nitrate, and ammonium, and their rates of change are computed using the given model equations and the model parameters.

The results of the simulation are plotted over time. Figure1 shows the concentration of organic matter in the compost pile. At the beginning of the simulation, the concentration of organic matter is high, but it decreases over time due to aerobic and anaerobic decomposition. After around 20 days, the concentration of organic matter stabilizes at around 5 g/L.

Figure2 shows the porosity of the compost pile. The porosity starts at 0.5, but it decreases over time as the compost pile becomes more compact. By the end of the simulation, the porosity is around 0.35.

Figure3 shows the concentration of oxygen in the compost pile. At the beginning of the simulation, the concentration of oxygen is low, but it increases over time due to the flow of air through the compost pile. After around 10 days, the concentration of oxygen stabilizes around 18 vol/vol.

Figure4 shows the concentration of nitrogen in the compost pile, with separate lines for nitrate (NO_3) and ammonium(NH_4). At the beginning of the simulation, the concentration of nitrate is low, while the concentration of ammonium is high. Over time, the concentration of ammonium decreases due to nitrification, while the concentration of nitrate increases due to de-nitrification. After around 20 days, the concentration of nitrate stabilizes at around 6 g/L, while the concentration of ammonium stabilizes at around 1 g/L.

The simulation results provide insights into the dynamics of the composting process and how the concentrations of different compounds change over time. The model can be used to optimize the composting process by adjusting the model parameters to achieve desired compost quality and efficiency.

Conclusion

The composting process model presented in this paper provides a useful framework for studying the biological processes that occur during composting. The model accounts for aerobic and anaerobic decomposition of organic matter, nitrification, and de-nitrification, and includes several parameters that affect the rates of these processes. The simulation results show that the model can capture the dynamics of organic matter, porosity, oxygen, and nitrogen concentrations over time.

The results suggest that the composting process is initially dominated by aerobic decomposition, which consumes oxygen and generates carbon dioxide. As the oxygen concentration decreases, anaerobic decomposition becomes more important, leading to the production of methane and other volatile organic compounds. Nitrification and de-nitrification also occur, leading to the conversion of ammonium to nitrate and back, respectively. The simulation results can help in optimizing the composting process and designing composting systems that are more efficient and environmentally friendly.

Finally, the composting process model presented in this paper is a valuable tool for researchers and

practitioners working in the field of composting, as it provides a quantitative framework for studying the complex interactions between microorganisms, organic matter, and environmental factors that occur during composting.

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Appendix 1

```
clc; clear all; close all.
% Parameters definition
k1 = 0.04; % Rate constant for aerobic decomposition of organic matter
k2 = 0.008; % Rate constant for anaerobic decomposition of organic matter
k3 = 0.03; % Rate constant for nitrification
k4 = 0.02; % Rate constant for denitrification
Ks = 25; % Half-saturation constant for aerobic decomposition
Kn = 10; % Half-saturation constant for nitrification
Kd = 20; % Half-saturation constant for denitrification
theta = 0.5; % Porosity of compost pile
Q = 50; % Flow rate of air through compost pile
C0 = 20; % Initial concentration of organic matter in compost pile
NO30 = 5; % Initial concentration of nitrate in compost pile
NH40 = 10; % Initial concentration of ammonium in compost pile

% Time interval and initial conditions definitions
tspan = [0 30].
y0 = [C0; 1-theta; 0; NO30; NH40].

% Model simulation
[t,y] = ode45(@(t,y)
 compost_model(t,y,k1,k2,k3,k4,Ks,Kn,Kd,theta,Q), tspan, y0);

% Plot the results
figure
plot(t,y(:,1));
xlabel('Time (days)');
ylabel('Organic matter (g/L)');

figure
plot(t,y(:,2));
xlabel('Time (days)');
ylabel('Porosity');

figure
plot(t,y(:,3));
xlabel('Time (days)');
ylabel('Oxygen concentration (vol/vol)');

figure
plot(t,y(:,4),'b',t,y(:,5),'r');
legend('NO3','NH4');
xlabel('Time (days)');
ylabel('Nitrogen concentration (g/L)');

% Define model equations
function dydt = compost_model(t,y,k1,k2,k3,k4,Ks,Kn,Kd,theta,Q)
   % Extract variables from state vector
   C = y
```

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Experimental

ASSESSMENT OF ALCOHOL CONSUMPTION AND NUTRITIONAL STATUS OF COMMERCIAL DRIVERS IN SELECTED OSHODI TERMINAL IN LAGOS STATE

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Abstract

Consumption of alcohol is prevalent among commercial drivers is a public health problem which has been of concern to the stakeholders. Therefore, this study examined dietary patterns, alcohol intake and nutritional status of commercial drivers at different motor parks in Oshodi Lagos state. Less than half (45.0%) of the respondents are between 31-40 years while 17.5% were between 21-30 years of age. Exactly 67.0% were Yoruba, 11.0% were Igbo while 2.2% were Hausa. Nearly 12.0% drove ordinary buses, while 44.5% of the drivers drove luxurious buses. Majority of the respondents (61.0%) earned above ₦90,000 monthly while 9.0% earned between ₦31,000- ₦60,000. Also, 24.5% were contacted in Terminal 1, while 25.0% and, 11.0% were contacted at Under-bridge park and Terminal 2 respectively. Above half (74.5%) ate thrice daily while 27.0% always skipped meals. Majority (76.5%) ate in-between meals while 23.5% did not. Above half (59.0%) ate snacks, ate fruits (7.0%), took juice (3.0%) while 5.0% ate food as in-between meals. Almost all consumed alcohol (85.5%) while 14.5% did not take alcohol. Almost half (45.5%) consumed alcohol frequently, (37.5%) took alcohol twice while (4.17%) took alcohol more than once. Also, 32.5% were heavy drinkers while 44.0% were mild drinkers. Nutritional status of the respondents showed that underweight, normal nutritional status, overweight and obese was 14.0%, 44.5%, 26.0% and 15.5% respectively. There was no significant association between Body Mass Index (BMI) and alcohol consumption pattern. Government should introduce nutrition mentoring program for all drivers.

Keywords: Alcohol, food habits, malnutrition, nutritional status

1.0 INTRODUCTION

The consumption of alcohol among drivers is a major public health issue of concern. Driver's ability to drive successfully from point of origin to destination is an important component of road safety. Drivers in most part of the world especially in developing countries, do not get to their final destinations. As people travel across the country through villages strategically located along highways have more than 3000 motor parks, kiosks, stores, restaurants and joints where they eat, drink alcohol, and smoke without closing time (Adekoya, 2011). Nigeria and South Africa arguably have the highest road traffic death rates (33, 7 and 31, 9/100 000 respectively) (WHO, 2013, cited in Okafor, Odeyemi, Dolapo, Ilika and Omosun (2014). No countries have comprehensive road safety laws on five key risk factors: drinking and driving, speeding and failing to use motorcycle helmets, seat-belts and child restraints (WHO, 2013, cited in Okafor *et al.*, 2014). Furthermore, speed limit violation which is most times, often induced by excessive drinking has become a prevalent factor in road traffic crashes, accounting for 39% of road crashes recorded nationwide between January 2014 and August 2014 (WHO, 2013, cited in Okafor *et al*., 2014).

The risk associated with driving (truck, bus and taxi) is very high and has an adverse effect on their nutritional status due to the unpredictable nature of their profession which expose them to long work hours (up to 14 hours per day), noise, prolonged sitting and unhealthy lifestyles (May *et al.,* 2016). A researcher in Kano, Nigeria have found that due to prolonged sitting, the long duration of driving, increased vibrations and other factors, professional drivers such as bus drivers, truck drivers and taxi drivers are at high risk of developing work-related musculoskeletal disorders (Rufai *et al*., 2015). A high level of alcohol consumption is associated with many mental disorders such as euphoria, hyperactivity, anorexia, insomnia, lewdness, and depression when they are shared with tobacco smoking (Ferreira *et al.,* 2019). Alcohol increases appetite and promotes extra calories that the body does not need (Stanton *et al*., 2020).

Conventionally it has become a trend in Nigeria commercial drivers, consume alcohol under the pretense of taking medicinal beverages (herbs mixed with alcohol)

locally called "opaehin", "paraga", or "fidigbodi". These drinks are common and popularly consumed in many neighbourhoods which are sold by vendors in motor parks where commercial drivers have unhindered access (Oluwadiya & Akinola, 2012).

Over the years alcohol consumption is culturally acceptable globally (Smart, 2007). It is highly consumed by various class and its consumption has been considered normal, especially when drunk without outright intoxication (Adewuyi, 2014). The pattern and purpose of consumption vary considerably among societies and within communities (Adewuyi, 2014; Awonusi & Adegboyega, 2015). Globally, tobacco use is second leading cause of death, while the harmful use of alcohol is the third leading cause of morbidity (WHO, 2010).

Conventionally, one most commonly consumed herbal preparations being sold among the Yorubas of the South-west Nigeria is Paraga, which has been defined by Oshodi and Aina (2007) as "a mixture of unrefined or poorly refined alcohol and herbs which is periodically ingested, as a form of self-medication against certain illnesses and disease".

Over the years, most studies on public transportation system has focused mainly on both the vehicle and its associated costs (World Bank, 2005), affordability and level of service (Carruthers *et al*, 2005; Benmaamar, 2003) as well as other indices such as access, waiting and journey time. No study have attempted to show any relationship between dietary patterns, alcohol consumption and nutritional status of drivers within this area. Therefore, this study becomes important to examine dietary patterns, alcohol intake and nutritional status of commercial drivers at different parks in Oshodi, Lagos state. However, findings from this study will give baseline information which could be consulted for advocacy.

2.0 METHODOLODY

Oshodi Transport Terminal is situated within the Oshodi area of Lagos State, Nigeria. **Oshodi-Isolo** (Yoruba: *Oṣòdì-Ìsọlọ̀*) is a Local Government Area (LGA) within Lagos state. It is located on latitude 6°33'18.1"N (6.5550400°) and longitude 3°20'37.1"E (3.3436300°) on the map. At the 2006 Census it had a population of 621,509 people, and an area of 45 square kilometers. These bus terminals are located between the Lagos-Apapa expressway and the Agege motor road. The Oshodi Bus Terminal is divided into three different terminals namely: Terminal 1, Terminal 2, and Terminal 3. The Oshodi bus terminal is divided into three terminals called: Terminal 1, Terminal 2, and Terminal 3. Each of the bus terminals is 30000 square meters and harbor lot of facilities which such as: loading bays, ticketing stands, driver lounge, parking areas and restrooms. The Oshodi Bus Terminal began operation in May 2019. Terminal 1 functions for interstate transportation, and it was designed for destinations spanning the southwest, southeast, FCT, and Northern states. Terminal 2 is for intercity routes. Ikeja, Agege, IyanaIpaja, egbeda, AbuleEgba etc. Terminal 3 enroute such as Mile 2/Festac, Airport road, Bariga/New Garage, Tincan, Orile, Apapa/Wharf, ejigbo, Ajegunle/Boundary, Ojodu/Berger, Gbagada/Anthony, EkoIjumota, IyanaIsolo/Jakande Gate/ Itire, Ojota/Ketu/Mile 12, Adeniji, Eko Hotel all within the state.

Sampling design

This study design was cross sectional and descriptive (Lauren, 2020) among drivers in Oshodi, Lagos state, Nigeria.

Sampling Technique

Population size

This study involved male drivers in Oshodi, Lagos state. Known population of four hundred (400) drivers work within this terminals. These commercial drivers included the bus, truck and taxi drivers. Conductors who either coordinate or collects money from the drivers were excluded from the study.

Sample size

Two hundred (200) drivers were randomly contacted for this study. Drivers were met in person as they arrived for their turn, and they were administered questionnaire. No reward or payment was awarded to drivers who participated in the study. Number of drivers for this study was drawn from five different parks which are (under bridge Oshodi, terminal 1, terminal 2, terminal 3 and Iyana brown Oshodi), to include 50 commercial drivers who were purposively considered for this study.

Therefore, the Taro Yamane formula (Yamane, 1967) was used to determine the sample size.

$$n = \frac{N}{1 + N * (e)^2}$$

(Taro Yamane 1967)

Where N= Population size (400)

n = Sample size

e = Margin of error (0.05)

$$n = \frac{400}{1 + 400*(0.05)^2}$$

n = 200

Data Collection Method

For this study, a pretested structured questionnaire was administered to the respondents and it has four sections which includes;

SECTION A: The socio demographic (age, sex, ethnic, group, religion, family type, number of children, marital status), socio economic (monthly income) characteristics of the respondents.

SECTION B: Anthropometry measurements involved weight and height was used to measure body mass index (BMI kg/m). Body weight would be measured using the bathroom weighing scales, with the person wearing light clothes and no shoes. Body weight would be expressed in kilograms. The logarithm scale would be calibrated before and during the study and readings would be approximated to the nearest 0.1 kg. Height would be measured using a calibrated stadiometer with the respondent standing in meter. Height would be expressed in meters and readings would be taken to the nearest 0.1cm. This would be used as an indicator of nutritional status based on the following WHO criteria (WHO, 2000)

SECTION C: Dietary habits which includes the number of meals taken in a day, skipping of meals and places where the meal was taken.

SECTION D: Alcohol consumption pattern and intake.

3.7 Data analysis

Data was analysed using Statistical Package for Social Sciences (SPSS) version 22.0 software (SSPS, chicago, IL, United States). Analyzed data was represented using descriptive statistics (frequency, percentage, mean value, and standard deviation). Chi square was used to establish association between alcohol consumption and BMI while statistical significance was set at ($p<0.05$).

3.0 RESULTS

Socio-demographic characteristics of the respondents

Table 1 shows the socio demographic and socio-economic characteristics of the respondents in respect of age, sex, ethnic group, marital status, education, religion, family size, type of family, annual income, residential area, class handled, years of teaching, type of school and working hours. About 45.0% of the respondents are between 31-40 years while 17.5% were between 21-30 years of age. Majority 67.0% were Yoruba, 11.0% were Igbo while 2.2% were Hausa. More than 66.9% were married while 1.6% were widow. Half (50.0%) were Muslims while 17.5% were traditionalist. Majority (53.0%) came from polygamous while 47.0% came monogamous. Majority had secondary education (45.5%) while some 11.5% had no education. Few 12.0% drove bus, while 44.5% of the drivers drove luxurious bus. Majority of the respondents 61.0% earned above ₦90,000 monthly while 9.0% earned between ₦31,000- ₦60,000. Also, 24.5% were contacted in Terminal 1, while 25.0%, 11.0% were contacted at under-bridge and Terminal 2 respectively.

Table 1: Socio Demographic Characteristics of the Respondents

Variables	Frequency	Percentage
Age (years)		
21-30	35.0	17.5
31-40	90.0	45.0
41-50	75.0	37.5
Total	**200.0**	**100.0**
Ethnicity		
Yoruba	134.0	67.0
Igbo	22.0	11.0
Hausa	44.0	22.0
Total	**200.0**	**100.0**
Religion		
Traditional	35.0	17.5
Islam	100.0	50.0
Christian	65.0	32.5
Total	**200.0**	**100.0**
Family structure		
Monogamy	94.0	47.0
Polygamy	106.0	53.0
Total	200.0	100.0
Type of vehicle		
Bus	24.0	12.0
Car	60.0	30.0
Luxurious	89.0	44.5
Taxi	27.0	13.5
Total	**200.0**	**13.5**
Name of park		
Terminal 1	49.0	24.5
Terminal 2	22.0	11.0
Terminal 3	44.0	22.0
Under bridge	50.0	25.0
Iyana brown	35.0	17.5
Total	**200.0**	**100.0**
Secondary	91.0	45.4
NCE/OND	35.0	17.5
Total	**200.0**	**100.0**

Table 1 (Cont'd): Socio demographic characteristics of the respondents

Variables	Frequency	Percentage
Family size		
5-7	17.0	8.5
8-10	70.0	35.0
>10	113.0	56.5
Total	200.0	100.0
Marital status		
Single	57.0	28.5
Divorced	101.0	50.5
Widow	42.0	21.0
Total	**200.0**	**100.0**
Educational level		
No education	23.0	11.5
Primary	51.0	25.5
Secondary	91.0	45.4
NCE/OND	35.0	17.5
Total	**200.0**	**100.0**
Monthly income (₦)		
31,000-60,000	18.0	9.0
61,000-90,000	60.0	30.0
>90,000	122.0	61.0
Total	**200.0**	**100.0**

Food Habits of Respondents

Table 2 shows information on dietary habit and food intake. More than half (74.5%) of the respondents ate thrice in a day while a little over one quarter (27.0%) always skipped meal. Majority of the respondents (23.0%) that usually skipped meal, eat twice in a day while few (2.5%) of the respondents that do skipped meal eat once daily. The meal usually skipped in most cases was lunch (12.5%) and (11.5%) lack sufficient money to purchase meal, (3.0%) normal routine (4.0%) was due to lack of appetite. Almost all of the respondents (93.0%) usually took breakfast, while (7.0%) do not take breakfast.

In addition 39.5% took breakfast between 6:00-7:00am, (38.5%) took breakfast at 7:01-8:00am while (7.5%) usually breakfast between 8:01-9:00am. Almost all of the respondents (93.0%) took lunch while (7.0%) did not take lunch. Furthermore, (8.0%) took lunch between 12:00-1:00pm, (23.5%) took lunch between 1:01-2:00pm, while (27.5%) usually took lunch between 2:01-3:00pm and majority (32.0) took lunch between 3:01-4:00. Almost all (91.0%) took dinner while (9.0%) do not take dinner. Also, (17.5%) took dinner between 6:00-7:00pm, majority (37.0%) took dinner between 7:01-8:00pm, (19.5%) took dinner between 8:01-9:00pm while only a small amount (1.0%) took dinner above 10:00pm.

More than half of the respondents (76.5%) ate in-between meals while (23.5%) did not eat in-between meals. Furthermore, majority (59.0%) ate snacks, (7.0%) ate fruits, (3.0%) took juice while (5.0%) ate food as in-between meals. Also, (11.5%) did not take in-between meals due to lack of money, some (3.30%) did not as it is a routine, (4.0%) did not because they lacked appetite while (1.5%) did not take in-between meals because it was their habit. Moreover, more than half of the respondents 62.0% of the respondents bought food from vendors while (38.0%) did not buy from vendor. Additionally, 12.5% of the respondents bought food from vendor every day, (24.0%) frequently bought food from vendor while almost half (26.5%) occasionally purchased food from vendors.

Also, almost half (36.5%) of the respondents purchased lunch from vendor, while 22.0% purchased breakfast and only (3.0%) purchased dinner from food vendor. Majority (73.0%) of the respondents preferred home-made diet while (22.0%) preferred diet from food vendor. Majority (75.0%) of the respondents prepare food in their house every day, while (19.5%) do not prepare meal at home. Almost all (86.0%) of the respondents did not smoke, while only (14.0%) smoked. Furthermore (11.5) of those that smoked, smoked twice while 1.5% smoked once.

Table 2: Food habits of respondent

Variables	Frequency	Percentage
How many times do you eat in a day?		
Once	5.0	2.5
Twice	46.0	23.0
Thrice	149.0	74.5
Total	**200**	**100**
Do you skip meal?		
Yes	54.0	27.0
No	146.0	73.0
Total	**200**	**100**
If "yes" state the meal skipped		
Breakfast	16.0	8.0
Lunch	25.0	12.5
Dinner	10.0	5.0
No	24.0	12.0
NA	125.0	62.5
Total	**200**	**100**
What is the reason for skipping meal?		
No money	23.0	11.5
Routine	6	3.0
Appetite	8.0	4.0
Lateness	2.0	1.0
Habit	3.0	1.5
No response	32.0	16.0
Not Applicable	126.0	63.0
Total	**200**	**100**
Do you take breakfast		
Yes	186	93.0
No	14	7.0
Total	**200**	**100**

Table 2 (cont'd): Food habits of respondent

Variables	Frequency	Percentage
What time do you take breakfast		
6:00-7:00am	79.0	39.5
7:01-8:00am	77.0	38.5
8:01-9:00am	15.0	7.5
9:01-1:00am	8.0	4.0
No Response	3.0	1.5
Not applicable	18.0	9.0
Total	**200**	**100**
Do you take lunch		
Yes	186.0	93.0
No	14.0	7.0
Total	**200**	**100**
What time do you take lunch		
12:00-1:00pm	16.0	8.0
1:01-2:00pm	47.0	23.5
2:01-3:00pm	55.0	27.5
3:01-4;00pm	64.0	32.0

No response	7.0	3.5
Not applicable	11.0	5.5
Total	**200**	**100**
do you take dinner		
Yes	182.0	91.0
No	18.0	9.0
Total	**200**	**100**
what time do you take dinner		
6:00-7:00pm	35.0	17.5
7:01-8:00pm	74.0	37.0
8:01-9:00pm	39.0	19.5
9:01-10:00pm	11.0	5.5
>10:00pm	2.0	1.0
No response	34.0	17.0
Not applicable	5.0	2.5
Total	**200**	**100**

Table 2: Food habits of respondent (Con't)

Variables	Frequency	Percentage
Do you eat in-between meal		
Yes	153.0	76.5
No	47.0	23.5
Total	**200**	**100**
If "yes" what do you usually take		
Snacks	118.0	59.0
Fruits	14.0	7.0
Juice	6.0	3.0
Food	10.0	5.0
No response	13.0	6.5
Not applicable	39.0	19.5
Total	**200**	**100**
Do you buy food from vendors		
Yes	124.0	62.0
No	76.0	38.0
Total	**200**	**100**
If "yes" how often		
Everyday	25.0	12.5
Frequently	48.0	24.0
Occasionally	53.0	26.5
NR	12.0	6.0
NA	62.0	31.0
Total	**200**	**100**
Which meal did you usually buy from food vendors		
Breakfast	44.0	22.0
Lunch	73.0	36.5
Dinner	6.0	3.0
NR	19.0	9.5
NA	58.0	29.0
Total	**200**	**100**

Table 2: Food habits of respondent (con't)

Variables	Frequency	Percentage
Do you prefer foods from vendors to your family diet?		
Yes	44.0	22.0
No	146.0	73.0
NR	6.0	3.0
NA	4.0	2.0
Total	**200**	**100**
How often do you prepare food in the house?		
Yes	150.0	75.0
No	39.0	19.5
NR	5.0	2.5
NA	6.0	3.0
Total	**200**	**100**
Do you smoke?		
Yes	28.0	14.0
No	172.0	86.0
Total	**200**	**100**
If "yes" how often do you smoke		
Once	3.0	1.5
Twice	23.0	11.5
NR	1.0	0.5
NA	173.0	86.5
TOTAL	**200**	**100**

Alcohol consumption of respondent

Table 3 shows the alcohol consumption of the respondents. Almost all 85.5% of the respondents do take alcohol while (14.5%) does not take alcohol. More than half (45.5%) consumed alcohol frequently, (37.5%) took alcohol twice while (4.17%) took alcohol more than once. Almost half 44.5% consumed above 5 bottles/sachet of alcohol per day while 25.0% consumed 1-2 bottles/sachet per day. Also, 85.5% took alcohol before driving while 14.5% do not, while 79.0% took alcohol after driving, 21.0% do not. Most the drivers consumed herbal mixture (44.5%) while 12.0% took beer. Majority 55.5% were alcohol addicted while 44.5% were not. Furthermore, 32.5% were heavy drinkers while 44.0% were mild drinkers.

Table 3: Alcohol consumption of respondent

Variables	Frequency	Percentage
Do you take alcohol		
Yes	171.0	85.5
N0	29.0	14.5
Total	**200**	**100**
If yes how often ?		
Once	23.0	11.5
Everyday	51.0	25.5
Frequently	91.0	45.5
Occasionally	35.0	17.5
Total	**200**	**100**
Amount of bottle/sachet consumed per day		
1-2 bottles/sachet	51.0	25.5
3-4 bottles/sachet	60.0	30.0
>5 bottles/sachet	89.0	44.5
Total	**200**	**100**
alcoholic beverages after meal		
Yes	111.0	55.5
No	89.0	44.5
Total	**200**	**100**
alcohol before driving		
Yes	171.0	85.5
No	29.0	14.5
Total	**200**	**100**
alcohol after driving		
Yes	158.0	79.0
No	42.0	21.0
Total	**200**	**100**
alcohol consumed		
Beer	24.0	12.0
Dry gin	87.0,	43.5
Herbal mixture	89.0	44.5
Total	**200**	**100**

Table 3: Alcohol consumption of respondent (cont)

Variables	Frequency	Percentage
alcohol addiction		
Yes	111.0	55.5
No	89.0	44.5
Total	**200**	**100**
level of alcohol consumption		
Heavy drinker	65.0	32.5
Light drinker	47.0	23.5
Mild drinker	88.0	44.0
Total	**200**	**100**

Figure 1 below shows the nutritional status of drivers. Underweight status of the respondents was 14.0%, 44.5% had normal nutritional status, 26.0 were overweight and 15.5% were obese.

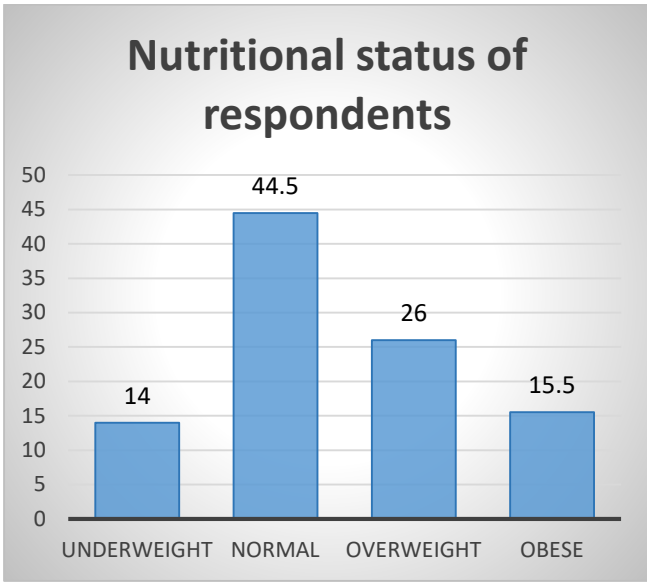

Fig 1: Nutritional status of respondents.

The association between Body Mass Index and Alcohol consumption pattern of the respondents

Table 4 below shows association between Body Mass Index with alcohol consumption of the respondents. Therefore, no significant association at ($p<0.05$) between body mass index and alcohol consumption pattern of the respondents.

Table 4: Association between BMI and Alcohol consumption

Variables	Body Mass Index				χ^2	p-value
	Underweight	Normal	Overweight	Obese		
Frequency(weekly)						
2-3times	4(1.6)	12(4.8)	7(2.8)	1(0.4)	4.7	0.58
>4 times weekly	18(7.2)	61(24.4)	33(13.2)	30(12.0)		
monthly	9(3.6)	34(13.6)	22(8.8)	19(7.6)		
No of bottles consumed						
2-4	7(2.8)	31(12.4)	16(6.4)	9(3.6)	7.6	0.27
5-6	15(6.0)	51(20.4)	38(15.2)	26(10.4)		
7-8	9(3.6)	25(10.0)	8(3.2)	15(6.0)		
Drinking alone						
Yes	10(4.0)	37(14.8)	14(5.6)	13(5.2)	7.2	0.30
No	8(3.2)	29(11.6)	13(5.2)	17(6.8)		

I don't know	13(5.2)	41(16.4)	35(14.0)	20(8.0)		
Alcohol consumed						
Beer	7(2.8)	18(7.2)	5(2.0)	5(2.0)	7.4	0.60
Wine	8(3.2)	30(12.0)	18(7.2)	18(7.2)		
Liquor	11(4.4)	44(17.6)	32(12.8)	21(8.4)		
Others	5(2.0)	15(6.0)	7(2.8)	6(2.4)		
Reason for alcohol						
Taste	96(24.0)	54(13.5)	19(4.8)	10(2.5)		
Feeling	35(8.8)	19(4.8)	12(3.0)	3(0.8)		

Mean values are statistically significant at p<0.05

Table 4: Association between BMI and Alcohol consumption (Con't)

Variables	Body Mass Index				χ^2	p-value
	Underweight	Normal	Overweight	Obese		
Reason for alcohol						
Taste	15(6.0)	52(20.8)	36(14.4)	27(10.8)	3.2	0.8
Feeling	14(5.6)	50(20.0)	25(10.0)	22(8.8)		
Boost confidence	2(0.8)	5(2.0)	1(0.4)	1(0.4)		
First time alcohol						
Curiosity	16(6.4)	46(18.4)	32(12.8)	27(10.8)	4.9	0.6
Custom	14(5.6)	59(23.6)	30(12.0)	23(9.2)		
Parents	1(0.4)	2(0.8)	0(0.0)	0(0.0)		
Alcohol location						
Bar						
Restaurant	8(3.2)	29(11.6)	13(5.2)	17(6.8)		
Someone's apartment	13(5.2)	41(16.4)	35(14.0)	20(8.0)		
Alcohol consumed						
Beer	7(2.8)	18(7.2)	5(2.0)	5(2.0)	7.4	0.60
Wine 8(3.2)	30(12.0)	18(7.2)	18(7.2)			
Liquor	11(4.4)	44(17.6)	32(12.8)	21(8.4)		
Others	5(2.0)	15(6.0)	7(2.8)	6(2.4)		

*Mean values *statistically significant at p<0.05*

DISCUSSION

The study aimed to assess the dietary habit, alcohol consumption and, nutritional status of commercial drivers in selected parks in Oshodi, Lagos state.

Below half (45.0%) of the respondents are between 31-40 years while 17.5% were between 21-30 years of age. Majority 67.0% were Yoruba, 11.0% were Igbo while 2.2% were Hausa. This is clearly possible because the research was conducted in south western Nigeria and it is to the work of (Ajewole *et al*., 2017). Majority had secondary education (45.5%) while some 11.5% had no education. Few 12.0% drove bus, while 44.5% of the drivers drove luxurious bus. Majority of the respondents 61.0% earned above ₦90,000 monthly while 9.0% earned between ₦31,000- ₦60,000. Their monthly income is good enough compared to some others who earned below minimum wage.

Majority (74.5%) ate thrice daily while a little over one quarter (27.0%) always skipped meal. Some of the respondents (23.0%) that usually skipped meal. This could be linked to the level of alcohol consumption been practiced by the drivers (Stanton *et al*., 2020). More than half of the respondents (76.5%) ate in-between meals and (23.5%) did not eat in-between meals. Furthermore, (59.0%) ate snacks, (7.0%) ate fruits, (3.0%) took juice while (5.0%) ate food as in-between meals.

Almost all (85.5%) of the respondents do take alcohol while (14.5%) does not take alcohol. More than half (45.5%) consumed alcohol frequently, (37.5%) took alcohol twice while (4.17%) took alcohol more than once. Furthermore, 32.5% were heavy drinkers while 44.0% were mild drinkers. There is a similarity to the study of (Adepoju *et al*., 2019).

Nutritional status showed that Underweight status of the respondents was 14.0%, 44.5% had normal nutritional status, 26.0 were overweight while 15.5% were obese. The high percentage of overweight and obesity is alarming.

4.0 CONCLUSION

The socio-economic status of the drivers is high, a lot of then earn above the minimum wage. However, their eating habit is not too good as they consume less nutritious diet. Also they consume a lot of alcohol wish could impair nutrient absorption. Consumption of numerous bottles/sachet of alcohol before, during and after driving is very common among the drivers in Lagos state. They majorly consume herbal alcohol drink over bottled beer because of the claim of its health effect and lower market prize. Nutrition education is necessary to enlighten all the drivers in Oshodi terminals in Lagos State on the need for adequate diet at all time. Government should also introduce nutrition mentoring programme for all drivers. Nutritionists and health practitioners should carry out more sensitization on the prevalence of hypertension and a need to do regular blood pressure checkup due to excessive alcohol consumption.

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Experimental

AN EXPONENTIAL-PARETO DISTRIBUTION APPROACH TO IMPROVING RAW MATERIAL QUALITY

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Abstract

This research investigates the use of the exponential-pareto distribution to improve raw material quality in cement production. Experienced researchers researched on the distribution and came up with the generalised form of the distribution. The weight of the raw components, aluminium, calcium, gypsum, iron, and silicon, was collected from 2007 to 2017. Using exponential pareto, average run lengths (ARL), control limit intervals (CLI), and process capability (CP) were calculated, and control charts were created. The investigation found that the control charts were statistically controlled, indicating that the distribution is effective. It was suggested that an exponential-pareto chart be used to control the quality of raw materials used in cement manufacture.

Keywords: Cement, distribution, exponential, pareto, production, raw material

1.0 INTRODUCTION

Control systems are used in industrial process control to promote consistency, economy, and safety in continuous production processes across many industries. Quality control (QC) is an essential component of quality management (ISO 9000:2005) and involves reviewing production parameters to fulfil quality standards. The Shewart control chart is an important instrument in statistical process control for assuring process stability and improvement (Adewara & Aako, 2020). Quality control has progressed from ensuring that end products fulfilled engineering specifications to controlling process variance for great goods. It entails creating and testing standards to assure the proper completion of products or services. Developing high-quality products and services is critical for global organizations.

Customer expectations establish quality and have an impact on market position (Gbadeyan & Adeoti, 2005). Meeting quality requirements necessitates establishing tolerance limits and concentrating on obtaining high-quality raw materials, equipment, and labour (Orga, 2011). In project management, quality control is assessing completed work to ensure that it is in accordance with the project scope (Phillips & Joseph, 2008). It is a procedure for ensuring stability, assessing performance, and taking corrective actions. The feedback loop is essential in quality control and is relevant in a variety of industries (Juran, 2000).

Recent research on combined distributions in quality control charts has focused on the creation of more robust and flexible strategies for dealing with varied data properties such as non-normality, multivariate dependencies, and autocorrelation. These ideas are useful for practitioners looking to improve process monitoring and control in a variety of sectors.

Chen et al. (2019) introduced a novel control chart framework that models the underlying process using several distributions such as normal, exponential, and Weibull. The graphic becomes more robust and adaptable in spotting process anomalies and shifts by merging these distributions. Jafari et al. (2020) concentrated on monitoring non-standard process data, which is typical in real-world circumstances. The researchers created mixed distribution control charts, which use a combination of distributions such as normal, lognormal, and gamma to capture the many properties of the data and increase the identification of process fluctuations.

Zhang et al. (2021) introduced multivariate procedures, which incorporate numerous quality parameters at the same time. This study presented joint distribution control charts, which use combined distributions to model the dependencies between numerous variables. These charts give a complete technique for monitoring and diagnosing multivariate process alterations by taking into account the joint behaviour of the variables.

Alwan et al. (2022) presented autocorrelation, which is a prevalent feature in many processes and in which observations depend on past values. This paper presented combination phase II control charts, which combine autoregressive integrated moving average (ARIMA) models with combined distributions. By capturing both time-dependent patterns and distributional properties, the proposed method enables effective monitoring of autocorrelated processes.

The research seeks to monitor the raw materials used in the cement production process using an exponential-pareto distribution model.

2.0 METHODOLOGY

Secondary data created by the company's quality control department for five different constituents (Aluminium, Calcium, Gypsum, Iron, Silicon) utilised in the production of cement in order to check the quality of the cement

produced is used for this project. The information ranges from 2007 to 2016.

Exponential-Pareto Distribution

If x has an Exponential-Pareto distribution with the scaling parameter, then x has a normal distribution $\theta_0^{*} = \theta_0^{\frac{1}{3.6}}$.

The Exponential-Pareto distribution charts' control limits are given by

$UCL_X = \mu_x + k\lambda_x$

(1)

$$\mu_0 = \lambda\left(1 + {}^{1}/_{\beta}\right) + k\theta_0\sqrt{\lambda\left(1 + {}^{2}/_{\beta}\right) - \lambda\left(1 + {}^{1}/_{\beta}\right)^2}$$

(2)

$$\mu_0 = \lambda\left(1 + {}^{1}/_{\beta}\right) + k\sqrt{\lambda\left(1 + {}^{2}/_{\beta}\right) - \lambda\left(1 + {}^{1}/_{\beta}\right)^2}$$

(3)

$=\boldsymbol{\mu_0 C_u}$

$LCL_X = \mu_x - k\lambda_x$

(4)

$$\mu_0 = \lambda\left(1 + {}^{1}/_{\beta}\right) - k\theta_0\sqrt{\lambda\left(1 + {}^{2}/_{\beta}\right) - \lambda\left(1 + {}^{1}/_{\beta}\right)^2}$$

(5)

$$\mu_0 = \lambda\left(1 + {}^{1}/_{\beta}\right) - k\sqrt{\lambda\left(1 + {}^{2}/_{\beta}\right) - \lambda\left(1 + {}^{1}/_{\beta}\right)^2}$$

(6)

$=\boldsymbol{\mu_0 C_l}$

The inner control limit for EPD mean is also given by

$$\mu_0 = \lambda\left(1 + {}^{1}/_{\beta}\right) + k_2\theta\sqrt{\lambda\left(1 + {}^{2}/_{\beta}\right) - \lambda\left(1 + {}^{1}/_{\beta}\right)^2}$$

(7)

$$\mu_0 = \lambda\left(1 + {}^{1}/_{\beta}\right) - k\sqrt{\lambda\left(1 + {}^{2}/_{\beta}\right) - \lambda\left(1 + {}^{1}/_{\beta}\right)^2}$$

(8)

$=\boldsymbol{\mu_0 C_u}$

In the above,K_1andK_2 ($K_1 > K_2$) are control coefficients to be determined by considering the target in-control ARL, say r_0

Then the average run length of the distribution is given as

ARL=$\frac{1}{1-P_{in}{}^{1}}$ (9)

and the standard deviation of the average run length is

SDRL = $\sqrt{\frac{P_{in}{}^{1}}{\left[1-P_{in}{}^{1}\right]^2}}$ (10)

The Average Run Length (ARL) metric is used to evaluate the performance of control charts, either alone or in conjunction with other metrics such as the Cumulative Sum (CUSUM) and Cumulative Poisson (CP) charts. ARL is the average number of in-control observations that occur before a change in process level or an out-of-control observation.

In practise, ARL is frequently calculated in conjunction with another parameter known as the Control Limit Index (CLI). Higher ARL and CLI values are expected when a process functions consistently over time and remains statistically in control. When the process deviates or is deemed out of control, it is preferable to have lower ARL and CLI levels.

The statistical software used in the analysis of this research work is R package. The code used in the computation is gotten from (Kimakova, 2021).

3.0 RESULTS

Table 1: Descriptive Analysis of the five raw materials

S/N	*Statistic*	*Aluminium*	*Calcium*	*Gypsum*	*Iron*	*Silicon*
1	N	360	360	360	360	360
2	Mean	32.62	31.56	32.54	33.69	36.03
3	Variance	402.69	327.83	282.04	447.14	515.93
4	StandardDev	20.07	18.10	19.55	21.15	22.71
5	Median	24.02	28.02	26.85	29.59	31.52
6	Minimum	10.01	10.08	10.11	10.11	10.09
7	Maximum	97.26	99.23	98.51	98.51	99.23
8	Range	87.25	89.15	88.40	88.40	89.14
9	Skewness	1.0931	1.0472	1.0718	1.0309	0.9619
10	Kurtosis	0.6907	0.9222	0.7854	0.4944	0.1803

11	Standard Err.	20.0663	18.1060	16.7940	21.1455	22.7140

Sources: Researchers Analysis Output, 2022

The analysis of this study is triple for each constituent (table 1) and the various statistics for each is as presented above.

Table 2: Average Run Length of estimated model parameter and MSE of EPD

Sample Size	**Estimate** θ	α	**MSE** θ	α
50	0.580	0.640	0.597	0.018
100	0.520	0.530	0.031	0.006
150	0.480	0.510	0.026	0.003
200	0.620	0.540	0.009	0.002
250	0.560	0.540	0.003	0.001

Table 2 shows the average run length and mean square error of the Exponential Pareto distribution for various sample sizes. When the average run length of the estimated model parameter and the mean square error are compared, the mean square error reduces as the size of the raw material sample rises. The associated Average Run Length (ARL) for a Shewart chart with the normal 3-sigma limit and a probability of 0.05, representing the likelihood of a single point slipping outside the control limit when the process is in control, is computed as 1/0.05, resulting in an ARL of 20.

Table 3: MLE of Exponential Pareto distribution using SE

Datasets	parameters	Estimate	SE	Log-like
Aluminium	x_m	1	2.34	-151.837
	θ	141.218	168.235	-23.45
	α	3.297	117.67	-12.45
Calcium	x_m	0.11	123.45	-1.616474
	θ	-0.888	0.111	-1.352
	α	0.419	0.059	-2.4523
Gypsum	x_m	1.34	0.345	-167.084
	θ	0.298	0.054	-223.333
	α	1.345	0.223	-126.359
Iron	x_m	11779.33	1043.882	-23.343
	θ	866.907	7675.908	-22.34
	α	1.234	45.65	-134.937
Silicon	x_m	-0.696	0.171	-124.45
	θ	0.606	0.087	-125.34
	α	1	0.345	-138.235
		0.46	0.078	-124.56

Table 4: X-Chart control limit for Exponential Pareto Distribution

Control limit	**Aluminium**	**Calcium**	**Gypsum**	**Iron**	**Silicon**
UCL	47.60622	46.12795	48.1012	108.239	19.2119
LCL	16.43533	16.98611	16.9698	18.0169	52.8454

Table 5: R Control Chart limit for Exponential Pareto Distribution

Control limit	**Aluminium**	**Calcium**	**Gypsum**	**Iron**	**Silica**

UCL	100.6622	15.5217	16.5814	18.0169	17.9141
LCL	16.6021	94.1102	100.5352	109.239	108.615

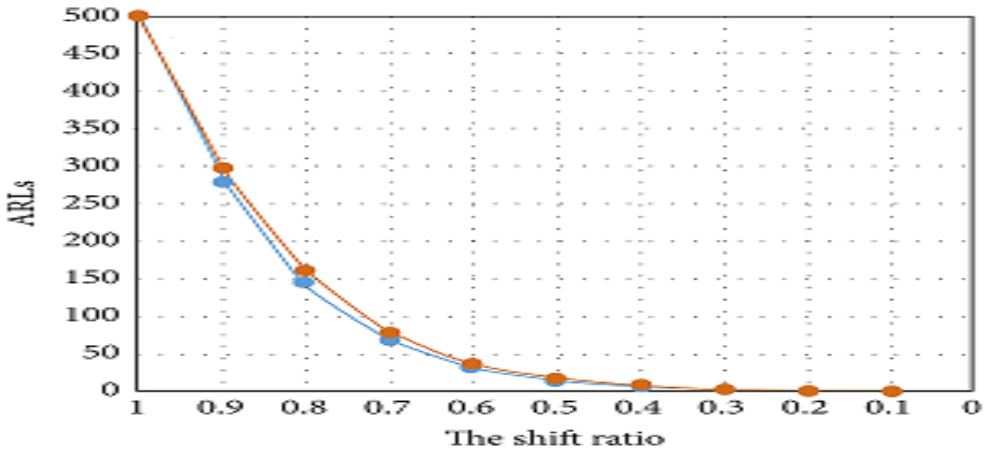

Figure 1: The ARL value for Exponential-Pareto distribution model

Figure 1 shows that the shift in ratio diminishes when the values of the Average Run Length (ARL) distribution grow at a constant interval. This data can be used to evaluate the effectiveness of a single control chart or a set of control charts. When the shift is minor (less than 2.5), a CUSUM chart will notice it before the control chart.

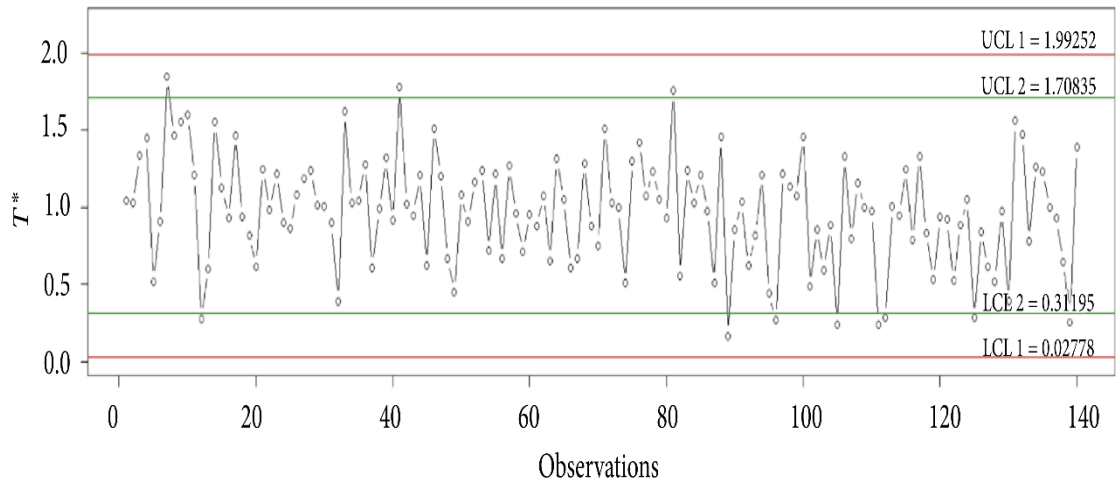

Figure 2: Control Chart of Exponential-Pareto Distribution

The control chart for the Exponential-Pareto distribution in figure 2 shows that none of the points are outside the control limit, indicating that when the distribution is applied to all of the constituents, the performance is in control, with no sign for any assignable causes of variation in the model estimated.

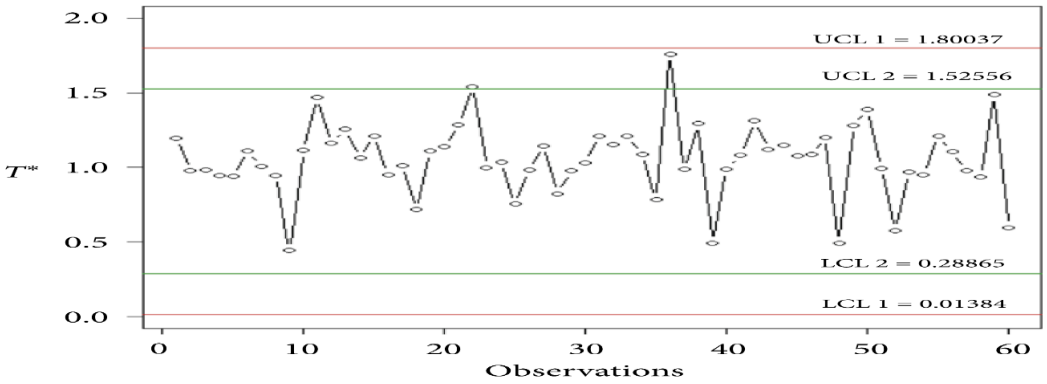

Figure 3: The control Chart for variance of Exponential-Pareto Distribution

Figure 3 shows that the variance of the Exponential-Pareto distribution indicates that none of the points fall outside the control limit, implying that when the distribution is applied to all constituents, the performance is in control, with no sign for any assignable causes of variation in the estimated model.

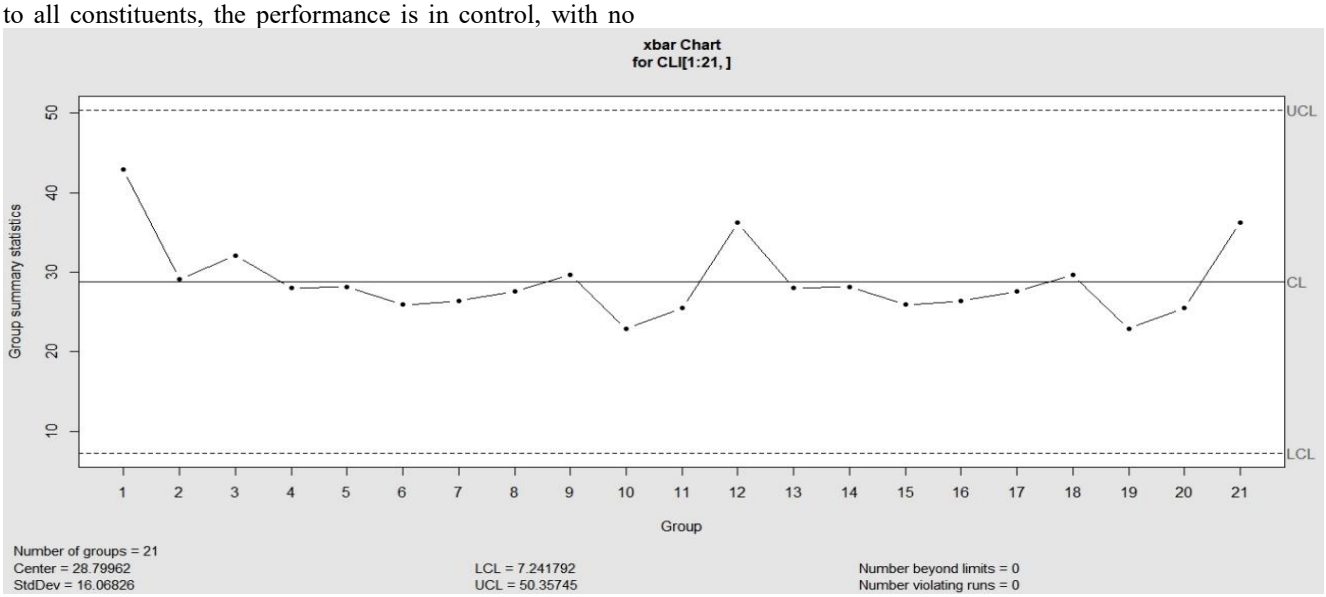

Figure 4: X-bar Chart for Control Limit Interval of Exponential-Pareto Distribution

The X-bar Chart (figure 4) for control limit interval indicates that all of the points are inside the control limit and that there are no assignable reasons of variance in the estimated model.

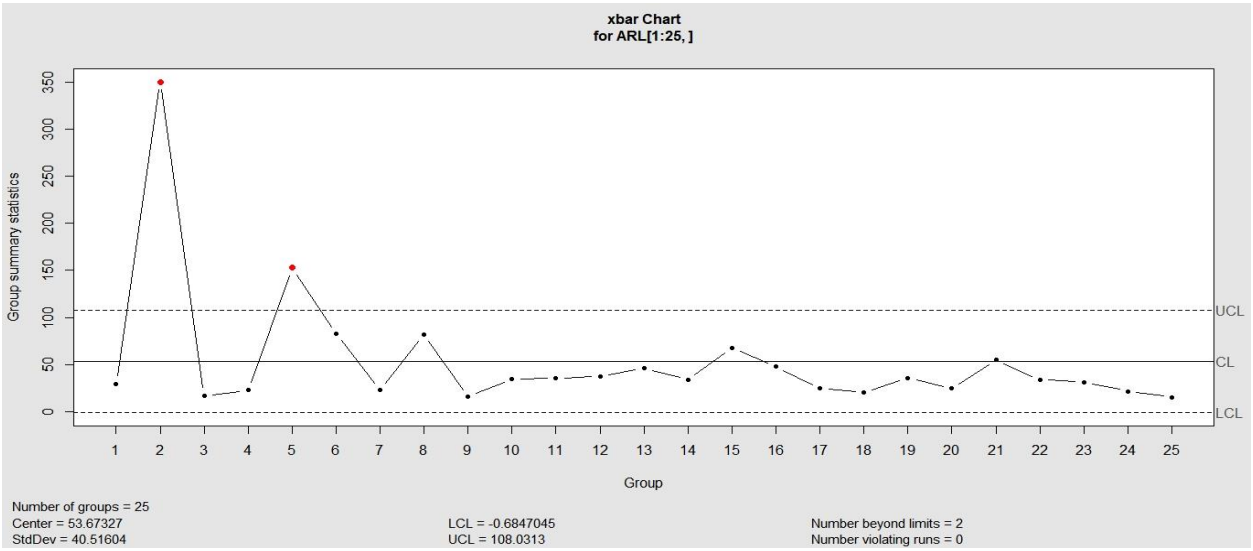

Figure 5: X- bar chart of Average run length Exponential-Pareto Distribution

Figure 5 depicts the mean of the average run length of EPD and reveals that two of the points are outside the control limit, causing the ARL chart to be statistically unstable.

Table 6: ARL, CLI and CP for mean, variance and standard Deviation of Raw Materials

	Statistic	*Aluminium*	*Calcium*	*Gypsum*	*Iron*	*Silicon*
	Mean	32.62	31.56	32.54	33.69	36.03
CLI	**variance**	402.69	372.8	282.04	447.14	515.93
	SD	17.995	18.1	19.55	21.15	22.71
	Mean	31.342	13.435	23.34.7	26.231	34.54
ARL	**variance**	372.83	112.8	223.76	234.87	34.87
	SD	32.82	32.43	65.78	211.12	112.34
	Mean	34.12	12.6	32.343	22.12	34.31
CP	**variance**	231.2	31.556	12.671	112.23	32.0202
	SD	19.345	16.825	17.9737	19.412	19.418

Discussion

We used the average run length (ARL), control limit interval (CLI), and process capability (Cp) of each element to estimate the parameters of Exponential-Pareto distribution models utilising their conditional distributions. The table below shows the findings for the parameters of each constituent utilised in the distribution for estimate.

The generated data, as shown in table 6, revealed that the EPD for the control Limit Interval (CLI) of calcium is the lowest when compared to other constituents, and the variance of silicon is the greatest CLI while the standard deviation of calcium is the lowest.

The average run length (ARL) of the EPD of each constituent demonstrates that aluminium has the greatest mean and iron has the biggest standard deviation.

For EP distribution, we conducted a Monte Carlo simulation analysis. To perform, several samples of each constituent's size were employed. We generated random samples with initial values of = 0.5 and = 0.5, and maximum likelihood estimators are derived using these parameters. The procedure is then repeated 360 times. For the estimates, the mean and mean squared errors (MSEs) are calculated. It is determined that the generated estimations are extremely near to the true values of the parameters. As a result, it demonstrates that the estimating technique is sufficiently accurate. Furthermore, it is investigated if the estimated MSEs decrease consistently with increasing sample size. Finally, we have very clearly witnessed the correctness of the estimating methods.

4.0 CONCLUSION

The purpose of this research is to look into the suitability of the Exponential-Pareto (EP) distribution for drawing control charts. The EP distribution model parameters are determined using the maximum likelihood estimation approach, and its performance is evaluated using a simulation study. Furthermore, the EP distribution is compared to other models using five real-world datasets generated from line one's crusher mill. When compared to

the other models investigated in this work, the EP distribution appears to provide a better fit to the data.

A simulation technique is used to evaluate the shift detection capabilities utilising the R programming language and software. For various mean shifts, control chart coefficients are determined, and different values of Average Run Length (ARL) and Standard Deviation of Run Length (SDRL) are created. The ARL and SDRL figures show that the proposed control chart outperforms existing charts. The process is statistically stable since the ARL, Control Limit Index (CLI), and Cumulative Poisson (CP) production operations are under control, with all data points falling inside the control limits. As a result, the article advises that exponential-pareto be used to measure the quality of raw materials for manufacturing.

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Experimental

THE SIGNIFICANCE OF CULTURAL DIVERSIFICATION TO TOURISM DEVELOPMENT IN ILARO, OGUN STATE.

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ABSTRACT
This research examines where cultural diversification is significant in tourism and analyzes how some cultural characteristics can be harnessed to leveraged development. Cultural tourism, spurred by changes in cultural awareness and visitor demands, though has seen substantial changes in recent years, conveying cultural values and fulfilling a diverse tourist population. The research used a descriptive survey methodology and a sample size of 70 people. The study's representative sample population of students, residents, government employees, interviews, and questionnaires were used to gather primary data. Tables were used to present the data so that the results could be understood at a glance. 45.7% of respondents agreed that culture adds to tourism development in Ilaro. In comparison, 14.3% strongly agreed, but lack of cultural awareness is most noticeable in the areas where the vast majorities are Yoruba tribe, Celebrations, festivals, customs, dressing, cuisines, and languages are the critical significance of cultural diversity, where history and values are essential to every culture and tourism. The study recommends that all cultural leaders and stakeholders should invest more in cultural tourism developments, sensitizing and educating people on the impact of culture on local and national development.

Keywords: Cultural, development, diversification, tourism

1.0 INTRODUCTION

There needs to be more skepticism about the authenticity of the connection between the rapidly evolving culturally inspired motivations and the rapidly expanding culturally related destination activities and the original purpose and core notion of culture tourism (Hughes & Allen, 2005). Is the modern technical and civilized backdrop (caprice) or the classical principles of cultural convergence, interchange, and understanding that visitors and tourists use to plan their trips? There are a variety of strategies used by authors on the subject of cultural tourism to address these concerns. In addition, the analysis considers how cultural factors, such as improved image and social, affect the score points of tourism and the best strategies for boosting the attractiveness of building a comparative advantage in Nigeria's increasingly competitive tourism industry.

Different approaches have been taken to preserve local identity in the face of globalization and to promote tourism based on collected case studies in the field (OECD, 2009).
Themed opportunities and, in certain circumstances, opportunities in distinct locations bear fruit. Developing marketing consortia and fostering a sense of regional unity is essential due to the complexities of the culture and tourism sector. Cultural tourism is a type of tourism in which the primary goals of the trip are the appreciation and enjoyment of a destination's cultural offerings (both those that can be seen and those that can only be felt) (UNWTO, 2017).
The future of tourism in Nigeria is bright. A prosperous tourism industry is expected in a country with a wide variety of landscapes, scenic views, and historical sites to visit. This piece, however, shows serious issues plaguing Nigeria as a tourist destination, so, unfortunately that are not the case. Problems with infrastructure, terrorism, security, management, data collection, indigenous peoples' status, investment, budgeting, crime, political instability, health care, education, and awareness are just a few issues that plague the world today. The main goal of cultural tourism development in many countries is to ensure sustainable economic, social and cultural development combined with preservation and active enhancement of cultural resources through increased supply, diversity, quality and sale of possible cultural tourism services. In this light, this study aims to establish the relationship between cultures and tourism development in Nigeria, identify various cultures in the study area, and evaluate the effect of cultural components on tourism development in Nigeria.

The Diverse Cultures in Nigeria

Nigerian Culture is incredibly diverse. It is estimated that seven of Nigeria's 527 languages have died off (Babalobi, 2020). Moreover, Nigeria's 1150 recognized ethnic groups speak at least two of the country's many official languages. The Hausa, Fulani, Igbo, Yoruba, Efik - Ibibio, and Edo peoples are the six most prominent ethnic groups. The Hausa, Yoruba, and Igbo peoples comprise most of the population and are Nigeria's political and cultural powerhouses (pronounced ee-bo). The Fulani, Ijaw, Kanuri, Ibibio, Tiv, and Edo are among the many smaller ethnic groups in Nigeria. These peoples each had their unique history before being conquered by Europeans.

Cultural Practices of the Yoruba

The Europeans of the early nineteenth century mispronounced the term "Yoruba" (referring to the Oyo Empire) as "Yoruba," and this is where the name "Yoruba" comes from. Philosophy, religion, and folklore all play essential roles in Yoruba society. They are the threefold book of illumination in Yoruba land and its diaspora embodied in Ifa divination. There were two eras in the development of Yoruba cultural theory (Prince, 2018). Cosmogony and cosmology can be traced back to the first era. In contrast, "m Káàár-ojire," which means "The People who question 'Good morning, did you wake up well?'" in Yoruba, is the origin of the Yoruba language within Yoruba culture. The customs of greeting prevalent in Yoruba society are discussed (Falola & Akinyemi, 2016).

Yoruba people use many cultural references and practices to establish a feeling of group identification that is shared by members of the group both within and outside their sphere of influence. According to ancient Yoruba beliefs, everyone is subject to Ayanmo, also known as fate. The ultimate goal is for all people to realize Olodumare, where they merge with the divine creator and ultimate source of all energy ((Falola & Akinyemi, 2016; Prince, 2018). The Yoruba people are the most populous indigenous people in Nigeria and Western Africa. The Yoruba people are known for their outgoing nature and ability to express themselves through elaborate festivals and celebrations. Celebrations of all kinds, from nuptials to farewells to anniversaries, are marked by pomp and ceremony. Many still adhere to the original religion, which has a vast pantheon of deities, and the ancient lifestyle of living in agricultural compounds. The Yoruba have also become well-known for their music, characterized by one of the world's most intricate drumming cultures (Prince, 2018).

Igbo Society

According to the Igbo people, who live in southeastern Nigeria, Igbo Culture (Igbo: mental and Igbo) consists of their conventions, rituals, and traditions (Nwabude, 2022). Both traditional Igbo customs and more modern ideas have been incorporated over time. Igbo people live mainly in Nigeria's southeast and are known for their rich cultural heritage. They are one of Nigeria's largest and most prominent groups, accounting for a fifth of the country's total population. Igbos are also widely recognized as pioneering businesspeople in Nigeria and beyond.

Soups, including locally cultivated fruits, vegetables, and seeds, are the Igbo people's specialty. Oh, nsala, akwu, and okapi of Owerri are some of the best-known soups in Igboland. The Igbo people also traditionally hold that there is one creator, known to them as "Chineke" or "Chukwu," who was either an outside influence or a deity. Community, family, respect for elders, life, and hospitality are central to Igbo customs. Western influence through globalization, however, forces these cultural norms into direct conflict.

The Hausa Culture

Most Hausa people strongly believe in Allah and accept Muhammad as his prophet. They hope to one day undertake the pilgrimage (hajj) to the Muslim holy place in Mecca, pray the five daily prayers, read the Koran (Holy Scriptures), and fast throughout Ramadan. The Hausa people historically resided in both rural areas and larger settlements before European colonization. There, they farmed, kept cattle, and traded goods across Africa. The Hausa people use the Afro-Asian language Hausa, which is part of the Chadic family of languages.

The Edo Culture

The antique treasures of bronze, brass, wooden, and terracotta are safely stored in Edo state, Nigeria's stronghold and citadel of Culture. Most of these bronze and ivory artifacts were stolen during the British expedition in 1897. Benin City is home to numerous galleries and studios for the creative community. The Edo Kingdom of Benin is one of the best-known pre-colonial kingdoms on the Guinea Coast of West Africa.

It is famous for its brass and ivory art and complicated governmental organization. One of Africa's great medieval dynasties had its capital in Benin. For much of the 13th century, the native Edo population was governed by powerful clan heads. One oba, or monarch, had consolidated power by the 15th century.

The Impact of Culture on Tourism

It examines the policies and procedures of entire nations or regions whose cultural assets draw tourists. It also looks at how cultural resources are used in tourism, from product creation to distribution, to pinpoint the most critical aspects and policy actions that can boost a region's appeal to tourists, residents, and investors. The study's findings support the idea that cultural tourism enhances the allure and competitiveness of tourist hotspots and regional and national economies. Adding cultural experiences to a tourism package is a great way to stand out in a global market where competition is fierce. Culture, heritage, cultural production, and creativity can all benefit significantly from the revenue and publicity generated by the tourism industry (OECD, 2008). Destinations may improve their appeal as places to visit, live, work, and invest in by forging connections between their cultural offerings and the tourism industry. The authors examined how cultural factors contribute to a location's allure and competitiveness as a tourist hotspot. This book surveys the policies and procedures of many national and regional tourist hotspots, which rely heavily on their cultural offerings to draw visitors. The evolution of cultural resource generation and dissemination in the tourism industry is also analyzed.

Seeing as locals are the lifeblood of every tourist destination's cultural and creative offerings, winning them over to the cause of tourism development is becoming ever more critical (Baixinho et al., 2020). In addition to the positive effects that immigration has on the local economy, the cultural ties that immigrants maintain with their home countries can be powerful draws for tourists. Long-term, localities will need to get creative with how they foster, oversee, and promote their cultural offerings and tourist attractions. This is especially important if the people who visit, live, work, and invest in the area are to reap the full benefits of this connection.

2.0 METHODOLOGY

To avoid influencing or modifying the research's subject, we opted for a descriptive survey method for data collection. The study's representative sample population is local students, residents, and government employees. The sample size for this study, determined using a simple sampling procedure, was 70. Questionnaires, interviews, and presentations were utilized to gather information. The data was gathered via interviews, surveys, and interviews with experts (secondary sources). Questionnaires and interviews were used to gather primary data, while journals, completed projects, and the internet was mined for secondary data. In order to ensure the validity and reliability of the research instrument, 70 questionnaires were used in a pilot study. The questionnaire was revised based on responses to improve its accuracy and usefulness. In order to analyze the data, we employed a case study and cross-sectional design, and we relied on the basic descriptive statistics of frequencies and percentages.

3.0 RESULTS AND DISCUSSION

SECTION A: The Demographic Characteristics of the Respondents

Gender

Table 1 below suggests that 60% of the respondents are female, and 40% are male. This show that the questionnaire cut across both gender. Meaning more females loves cultural tourism compared to male.

Marital Status

The table shows that 45.7% of the respondents are single, 42.9% are married, 7.1% are divorced, and 4.3 are widows, meaning that single and married respondents cherish cultural tourism more.

Age of Respondents

Figure 3 shows that 20% of the respondents fall between the age of 20 years, 52.9% fall between the ages of 20-30, 17.1% are between the ages of 31-40, while 10% falls between 50 years and above.

Relationship between Culture and Tourism Development in Nigeria

Table 1 below shows that 2.9% of the respondent disagree that there is a relationship between culture and tourism, while 5.7% were undecided, 44.3% agreed and 47.1% strongly agreed

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Table 1: Relationship between and culture and tourism

Variables	Frequency	Percent
Disagree	2	2.9
Undecided	4	5.7
Agree	31	44.3
Strongly agree	33	47.1
Total	70	100

Table 2 below shows that 1.4% of the respondent strongly disagreed that culture adds to tourism development, 1.4% disagreed, 8.6% were undecided, 47.1% agreed, and 41.4% strongly agreed

Table 2: Culture adds to tourism development

Variable	Frequency	Percent
Strongly disagree	1	1.4
Disagree	1	1.4
Undecided	6	8.6
Agree	33	47.1
Strongly agree	29	41.4
Total	70	100

4.3.0 Identify various cultures in the study areas

Table 3 below shows that 4.3% of the respondent strongly disagreed that there are diverse culture in Ilaro, 21.4% disagreed, 20% were undecided, 40% agreed, and 14.3% strongly agreed.

Table 3: **There is diverse culture in Ilaro**

Variables	Frequency	Percent
Strongly disagree	3	4.3
Disagree	15	21.4
Undecided	14	20.0
Agree	28	40.0
Strongly agreed	10	14.3
Total	70	100.0

Evaluate the effect of the cultural component of tourism development in Nigeria

Table 9 below shows that 4.3% of the respondent strongly disagreed that religion affects tourism development positively, 20% disagreed, 15.7% were undecided, 45.7% agreed, and 14.3% strongly agreed

Table 4 Religion affects tourism development positively

Variables	Frequency	Percent
Strongly disagree	3	4.3
Disagree	14	20.0
Undecided	11	15.7
Agree	32	45.7
Strongly agree	10	14.3
Total	70	100.0

Table 5 below shows that 4.3% of the respondent strongly disagree that language makes effective social interaction possible, 8.6% disagreed, 18.6% were undecided, 41.4% agreed, and 27.1% strongly agreed.

Table 5. Language makes effective social interaction possible

Variables	Frequency	Percent
Strongly disagree	3	4.3
Disagree	6	8.6
Undecided	13	18.6
Agree	29	41.4
Strongly agree	19	27.1
Total	70	100.0

4.0 CONCLUSION

Travelers interested in Culture have visited Nigeria's cities and villages since ancient times. Celebrations, customs, cuisines, and languages from all across the world. History and values are essential to every culture, but most contribute little to the local economy (Ogundiran, 2021). This research has examined the role that highlighting rural areas' distinctive features and working to enhance their residents' standard of life and

economic growth can have in luring more visitors to Nigeria's rural towns. The findings show that Ilaro and Nigeria can benefit significantly from increased tourism development due to the country's rich cultural diversity.

The many directions that empirical studies of the connections between cultural engagement, heritage, and tourism point to are intriguing. This coincides with the result found in Noonan & Rizzo's (2017) research on the monetary aspects of cultural tourism. Furthermore, Peacock (2006) has claimed that technology developments are likely to promote a 'globalization of culture,' functioning as advertisement and, thus, encouraging tourism flows rather than having a replacement effect on actual cultural attendance. However, the research produces intriguing findings with real-world consequences for city and tourist officials who are constantly assessing the efficacy of cultural tourism projects (Cecil et al., 2010). Because of this, the success of cultural tourism rests mainly on how thoroughly government agencies research all cultural tourism resources (existing and undeveloped) in each town, but with the knowledge of the inhabitants to make it simpler for them to participate.

Based on our findings, it is recommended that Government should provide good infrastructure to aid the growth of cultural tourism, all stakeholders should invest more in cultural tourism development, sensitization and educating people on the impact of culture on tourism.

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Experimental

ASSESSING THE EFFECTS OF ILLEGAL MOTOR PARKS AT SANGO OTA ROADS INTERSECTION, SANGO OTA, OGUN STATE

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ABSTRACT
The assessment of the effects of illegal motor parks in the study area is necessitated due the manifestation of various environmental menaces. Two (2) areas of the illegal parking were Sango Ota road intersection – Abeokuta corridor (Motor Park A), and Sango Ota road intersection – Owode corridor (Motor Park B). A purposive sampling method was adopted, and a total of 60 transport operators, 75 commuters and 30 pedestrians were selected. Car has the highest number of vehicle plying the corridors with forty one (41%) , while an average of 9 vehicle is parked in Motor Park A within one hour with a parking concentration of an average of 77m^2 , and for Motor Park B, 64 vehicle was recorded with a parking concentration of an average of 194m^2 . Mini bus has the highest number of patronage in the two motor parks with a daily average of 319 commuters representing sixty two (62%) out of 514 commuters in Motor Park A, and 7061 commuters fifty nine (59%) out of 11908 commuters in Motor Park B, while fifty six (56%) of the commuters (the highest) in Motor Park A attributed closeness and cheaper rate to the reason for the choice of the motor park, and fifty one (51%) of the commuters (the highest) in Motor Park B attributed only closeness for their reason for the choice. An average of 16 minutes is added to the travel time during the peak period of a working day, while an average of 24 minutes is added during the peak period on Saturday. Forty seven percent of the pedestrians of Motor Park A have experienced major conflict with vehicle, while sixty three 63% of the pedestrians of Motor Park B have experienced major conflict with vehicle and hawking leading to indiscriminating dumping of waste is identified as a resultant effect. Necessary recommendations were made towards the elimination of the illegal motor parks.

Keywords: Commuters, illegal motor park, pedestrian, road intersection, traffic

1.0 INTRODUCTION

The importance of transportation to human survival cannot be overemphasized as immobility perpetuates poverty, while the need to provide motor parks becomes imperative where services are rendered to commuters in order to fulfil their various socio-economic obligations. Parking is an integral part of transportation planning, and motor park provision and management become a necessity when the nature of the urban centres are considered as being an interrelated with complex land uses which requires a well-planned and efficient performance of the transportation system. Ahmed (2014) identified on-road parking as a form of parking that involves all metered and unmetered parking lots along the roadsides, and this exists as a result of the non-availability of space for off- road parking.

Asiyanbola and Akinpelu (2012) have identified two types of on-road parking to include the official and non-official parking, while Olorunfemi (2014) noted that the achievement of easy movement in the city is dependent on the proper planning and monitoring of the transport system that must include adequate parking facilities in all places that attract vehicular/pedestrian traffic. Asiyanbola and Akinpelu (2012) observed that illegal parking accounts for 30 percent of the causes of traffic delay along the corridors of the urban centres with their various roads intersections, while Ahmed (2014) noted that the sequences of problems commonly appended to parking lots – legal or illegal (unauthorized) are caused partly by the transport operators, and the government agencies which often leads to the proliferation of parks in some nooks and crannies of the cities.

Ryre and Koglin (2014) noted that policy on Motor Park in most developing countries of the world, which Nigeria is inclusive, is mainly reactionary in solving the immediate problems, and this has often created a wide gap in transportation planning, and a missing strategic link between parking and the overall urban transport policy of the urban areas.

Major roads intersections are unique in nature owing to their traffic intensity which is often high with various categories of vehicle. The Sango-Ota roads intersection have manifested traffic bottleneck mostly due to the emergence of illegal motor parks along the corridors, and these illegal motor parks have

enhanced commercial activities on the roads, thereby resulting into vehicular/pedestrian conflicts; while the encroachment of the spaces provided for traffic flow of different categories of vehicle have limited the spaces. Hence, it is on this premise that the assessment of the effects of illegal motor parks in the study area becomes necessary. It is important to note that the choice for the patronage of these illegal motor parks in the study area by commuters provides the rationale behind their existence while the analysis of the socio-economic characteristics of commuters explain both the basis for the choice and the level of patronage across the various socio-economic variables considered in this study.

Olaseni (2011) noted that transportation infrastructure plays an important and catalytic role in the development of any nation in the world, and that length of roads in Nigeria is 193,200 kilometre, with the federal roads having a total of 34,123 kilometres length, the state with 30,500 kilometre length, and the remaining 129,577 kilometres as the length of the local government roads. However, the problem of transportation is multifaceted and multidimensional in nature, while the need for proper assessment of motor park facilities becomes imperative due to their role in achieving a good road transportation system devoid of traffic bottleneck. Hence, the traffic survey and parking survey are becoming major requirement for planning approval in the contemporary societies.

Adebayo and Zabairu (2013) identified two service management participants in Motor Park to include the customers (that is, the users of the motor park facilities), and the providers, and that conflict often exits between these two participants due to the poor service delivery. Litman (2006) has noted that illegal motor parks have been recognized as one of the main source of traffic congestion in urban areas, while Aderamo (2013) observed that illegal parking has been a bane to the achievement of good urban transportation, and that roadside motor parks have a common phenomenon which often result into traffic bottleneck, thereby reducing efficient movement of automobiles and delay in travelling time.

Papacostas and Prevedouros (2006) noted that parking utilization is a product of parking measurement and analysis, and that between 85% and 95% of the available parking capacity is often used in parking analysis, while Akanmu and Agboola (2015) identified crucial indices used for describing parking utilization to include; occupancy, accumulation, turnover, and average duration. It is important to note that Akanmu et al (2013) described parking management as all-encompassing actions and strategies targeted toward the elimination or minimization of disruptions to vehicular flow, achievable through adequate supply of facilities, pricing and regulations of the parking facilities. It is on this premise that the parking management principles are identified to include; optimization, sharing, flexibility, efficient pricing, users information, peak management, peculiarity and minimal expansion of supply.

2.0 METHODOLOGY

The assessment of the effects of illegal motor parks in the study area involves; the identification of the illegal motor parks by location and spatial coverage, the characteristics of the roads, traffic intensities, parking concentration and volume (7:00am - 6:00pm), parking duration, levels of patronage by commuters, and the effects of these illegal motor parks on traffic flow.

Sango –Ota is a town under Ado-Odo Ota Local Government Area of Ogun State, Nigeria, and its geographical co-ordinates are 6 42' 0" north, and 3 14' 0" east. It is accessed by Lagos-Abeokuta expressway and Idiroko-Ota road. Sango-Ota roads intersections are intersections that provide access to Ifo, Abeokuta, Lagos, Ijoko, Owode and Idiroko, with a fly-over which provides a direct link to Lagos and Abeokuta axis. Ota has the largest concentration of industries in Ogun State, and possesses a large market with important roads intersections (the Sango Ota roads intersections), located at the north of the toll-gate on Lagos-Abeokuta expressway. The illegal motor parks understudied are the two (2) motor parks which are located at the two (2) corridors (that is; Sango Ota to Abeokuta; and Sango Ota to Owode corridors) of the four (4) roads that form the Sango Ota road intersection under the Sango Ota Bridge.

STUDY DESIGN

The population of the study comprises of the total number of the illegal motor parks in the study area and the total number of vehicles in each identified motor park as at the time of investigation. The study design takes into cognisance of the variations that exist among vehicle used in the identified motor parks in the study area. Hence a stratified method of sampling was adopted where each type of vehicle were identified for the purpose of empirical investigation, and a random sampling was employed in the selection of the transport operators and commuters from each of the stratum while structured questionnaires were used to collect relevant data from the selected respondents. Spatial analysis of the width of each corridor of the intersections with the spatial area covered by the encroachment of roads by the vehicle was carried out.

Data on traffic counts of the four (4) corridors that form the intersection was collected, while data from the commuters (both for the inter-state service and intra city transport) on the level of patronage of the illegal motor parks, and the rationale behind the choice of the illegal motor park when compared to the other legal motor parks exiting within the vicinity were collected.

Two (2) illegal motor parks were identified along the two (2) corridors of the intersections and these illegal motor parks are for inter-state and intra-city transport system. However, a non –intrusive technique for conducting traffic count was adopted in which the manual counts technique was used for the four (4) corridors that make the intersections. The traffic counts was conducted for four (4) days of the week (Monday, Wednesday, Friday, and Saturday) between the 7:00am and 6:00pm for the purpose of assessing the traffic intensities of the corridors. Data on the parking concentration and volume between 7:00 am and 6:00pm for four (4) days of the week (Monday, Wednesday, Friday and Saturday) were collected, with the on-spot assessment of the roads.

A purposive method of sampling was adopted in the selection of the transport operators and the commuters. Hence, thirty (30) transport operators were selected randomly from each of the two (2) illegal motor parks, and this makes a total of sixty (60) transport operators, while seventy-five (75) commuters were selected randomly from each of the two (2) illegal motor parks, making a total of one hundred and fifty (150) commuters. However, sixty (60) drivers plying the corridors were randomly selected for the purpose of assessing the effects of the motor parks on traffic flow while thirty (30) pedestrians were selected as sampled respondents from each of the two (2) corridors where the illegal motor parks are in existence for the purpose of assessing the rate of vehicular/pedestrian conflicts

Illegal motor park services are in operational in two (2) locations of the study area, and these locations are; the Abeokuta corridor from the Sango Ota road intersection, and the Owode corridor from the Sango Ota road intersection. However, an average length of eighty six metres (86m) of the Sango Ota road intersection to Abeokuta corridor, is used for interstate and intra city Motor Park, while an average length of one hundred sixty four metres (164m) of the Sango Ota road intersection to Owode corridor, is used for intra city Motor Park.

Traffic Volume

Table 1 to Table 8 revealed the traffic volume generated on the four (4) corridors of the intersection.

3.0 RESULTS

Road Width and the Motor Parks

The importance of the corridors with their intersections cannot be overemphasized as the traffic intensities as shown in the traffic counts analysis (table 1 to table 8) have revealed a very high volume of traffic by all the categories of vehicle plying the roads.

Road Width and the Motor Parks

The width of each lane of the roads in the study area is 18 metres and the examination of the conditions of the roads revealed failed portions of significant spatial area along the roads, particularly the out-bounds of Lagos and Oju-Ore form the roads intersections and the blockage of all the existing drains of the roads by solid wastes of different types and volume, results into the overflow of storm water on the roads surfaces, particularly during a torrential rain burst.

Table 1: Traffic Count Analysis of Location A (Sango Ota Road Intersection to Toll Gate)

Date	Car	Coaster Bus	Mini Bus	Heavy Vehicles	Motor Cycle	Tricycle	Total
P.C.U	1.0	1.5	1.5	2.5	0.7	0.8	
Mon 7/11/22	1759	283	1014	198	1531	235	5020
Wed 9/11/22	1556	184	985	214	1247	110	4296
Fri 11/11/22	1948	301	1673	254	1438	399	6013
Sat 12/11/22	1273	277	1132	205	1685	224	4796
Total	6536	1045	4804	871	5901	968	20125
Daily Average	1634	261	1201	218	1475	242	5031
P.C.U Convert	1634	392	1802	545	1033	194	5600

Table 2: Traffic Count Analysis of Location B (Sango Ota Road Intersection from Toll Gate)

Date	Car	Coaster Bus	Mini Bus	Heavy Vehicle	Motor Cycle	Tricycle	Total
P.C.U	1.0	1.5	1.5	2.5	0.7	0.8	
Mon 7/11/22	1952	251	1040	244	896	264	4647
Wed 9/11/22	1260	134	1107	189	1221	258	4169
Fri 11/11/22	1117	229	1158	239	1314	248	4305
Sat 12/11/22	2140	222	1010	214	1249	274	5109
Total	6469	836	4315	886	4680	1044	18230
Daily Average	1617	209	1079	222	1170	261	4558
P.C.U Convert	1617	314	1619	555	819	209	

Table 3: Traffic Count Analysis of Location C (Sango Ota Road Intersection to Ijoko)

Date	Car	Coaster Bus	Mini Bus	Heavy Vehicles	Motor Cycle	Tricycle	Total
P.C.U	1.0	1.5	1.5	2.5	0.7	0.8	
Mon 7/11/22	1557	264	963	204	1101	357	4446
Wed 9/11/22	1212	224	855	147	981	228	3647
Fri 11/11/22	1439	287	982	172	1004	349	4233
Sat 12/11/22	1623	273	996	105	1429	373	4799
Total	5831	1048	3796	628	4515	1307	17125
Daily Average	1458	262	949	157	1129	327	4281
P.C.U Convert	1458	393	1424	393	790	262	

Table 4: Traffic Count Analysis of Location D (Sango Ota Road Intersection from Ijoko)

Date	Car	Coaster Bus	Mini Bus	Heavy Vehicles	Motor Cycle	Tricycle	Total
P.C.U	1.0	1.5	1.5	2.5	0.7	0.8	
Mon 7/11/22	1836	218	1011	187	1101	335	4688
Wed 9/11/22	1582	176	973	116	886	295	4028
Fri 11/11/22	1759	182	987	164	1006	307	4405
Sat 12/11/22	1947	221	1126	98	1121	319	4832
Total	7124	797	4097	565	4114	1256	17953
Daily Average	1781	199	1024	141	1029	314	4488
P.C.U Convert	1781	299	1536	353	720	251	

Table 5: Traffic Count Analysis of Location E (Sango-Ota Road Intersection to Abeokuta)

Date	Car	Coaster Bus	Mini Bus	Heavy Vehicles	Motor Cycle	Tricycle	Total
P.C.U	1.0	1.5	1.5	2.5	0.7	0.8	
Mon 7/11/22	1521	92	812	211	773	164	3573
Wed 9/11/22	1344	68	749	137	436	138	2872
Fri 11/11/22	1651	74	793	168	482	165	3333
Sat 12/11/22	1231	79	745	104	479	157	2795
Total	5747	313	3099	620	2170	624	12573
Daily Average	1437	78	775	155	543	156	3144
P.C.U Convert	1437	117	1163	388	388	125	

Table 6: Traffic Count Analysis of Location F (Sango Ota Road Intersection from Abeokuta)

Date	Car	Coaster Bus	Mini Bus	Heavy Vehicles	Motor Cycle	Tricycle	Total
P.C.U	1.0	1.5	1.5	2.5	0.7	0.8	
Mon 7/11/22	1730	74	795	231	553	195	3578
Wed 9/11/22	1493	62	696	164	542	153	3110
Fri 11/11/22	1918	75	813	121	604	187	3718
Sat 12/11/22	2026	59	864	143	695	174	3961
Total	7167	270	3168	659	2394	709	14367
Daily Average	1792	68	792	165	598	177	3592
P.C.U Convert	1792	101	1188	413	419	142	

Table 7: Traffic Count Analysis of Location G (Sango Ota Road Intersection to Owode)

Date	Car	Coaster Bus	Mini Bus	Heavy Vehicles	Motor Cycle	Tricycle	Total
P.C.U	1.0	1.5	1.5	2.5	0.7	0.8	
Mon 7/11/22	2131	49	944	217	1831	411	5583
Wed 9/11/22	1849	44	893	163	1537	392	4878
Fri 11/11/22	2063	58	938	186	1921	466	5632
Sat							

12/11/22	2326	46	971	121	1642	439	5545
Total	8369	197	3746	687	6931	1708	21638
Daily Average	2092	49	937	172	1733	427	5410
P.C.U Convert	2092	74	1401	430	1213	342	

Table 8: Traffic Count Analysis of Location H (Sango Ota Road Intersection from Owode)

Date	Car	Coaster Bus	Mini Bus	Heavy Vehicles	Motor Cycle	Tricycle	Total
P.C.U	1.0	1.5	1.5	2.5	0.7	0.8	
Mon 7/11/22	2235	91	821	265	615	463	4490
Wed 9/11/22	2131	74	774	115	502	454	4050
Fri 11/11/22	2746	83	858	284	545	493	5009
Sat 12/11/22	2141	79	825	296	602	488	4431
Total	9253	327	3278	960	2264	1898	17980
Daily Average	2313	82	820	240	566	474	4495
P.C.U Convert	2313	123	1229	600	396	380	

The analysis of traffic volume for the four (4) locations of the selected four (4) days revealed that car has the highest volume of vehicle that ply the roads, with a daily average volume of 14124, which represents 41% of the total volume of traffic generated on the roads, while coastal bus has the lowest volume of traffic generated on the roads with an average of volume of1208, representing 3% of the total volume of traffic. It is important to note that a total daily average of 34857 traffic volume generated by all the categories of vehicle plying the roads that make up the roads intersection revealed a very high volume of traffic, which implies that the corridors are of great importance to the socio-economic development of the state, and the nation at large.

Data on the level of patronage revealed that Motor Pak A, Mini Bus has the highest number of patronage with daily average of 319 commuters out of 514 commuters, representing 62% of the total percentage of level of patronage of commuters in the motor park, while in Motor Park B, Mini Bus has the highest number of patronage with daily average of 7061 commuters out of 11908 commuters patronizing the motor park, and this represents 59%.

DISCUSION

Parking Concentration and Parking Volume

The total number of vehicle by type parked in a motor park for the purpose of motor park service within a particular period of time is expressed as the parking volume, while its spatial spread on a geographical space over a specific period of time is the parking concentration. However table 4.10 shows the parking concentration and parking volume within the study area. Motor Park A is the motor park located at the Sango Ota road intersection to Abeokuta corridor, while Motor Park B is the motor park located at the Sango Ota road intersection to Owode corridor.

An average of nine (9) vehicles is parked in Motor Park A within one hour (1hr), and these vehicles comprised of cars and mini buses which are used for intra-city transportation services while the destinations of vehicles for these services are; Ifo, Ilaro, and Abeokuta. However, an average of seventy-seven metres square ($77m^2$) was recorded as the spatial coverage of the vehicles parked in Motor Park A within one hour (1hr).

For Motor Park B, an average of sixty-four (64) vehicles is parked within one hour (1hr), and these vehicles comprised of cars, mini-buses, motorcycles and tricycles which are used for intra-city transportation services to Ojuore, Iyana- Iyesi, Atan, and Owode. The spatial area covered by vehicles in the motor park within one hour (1hr) is one hundred and ninety-four metres square ($194m^2$).

The Rate of Response of Transport Operators and the Analysis of Data

Data on the commencement of operation at the Motor Park, type of vehicle used for operation, and number of trips per week, were collected from thirty (30) transport operators selected from each of Motor Park, making a total of sixty (60) transport operators.

The year of commencement of operation at the two motor parks is germane to this study, as this offers the

year of the use of the space for the illegal motor park operation. Data collected on the year of commencement of operation in the motor parks.

Fifteen (15) respondents out of thirty (30) respondents, representing 50% of the total respondents in Motor Park A has been operating for a long time (11-20years), and this duration is significantly long when year of operation is considered as a factor of the years of the commencement of the illegal motor park, while for Motor Park B, the table revealed that eighteen (18) respondents out of thirty (30) respondents, representing 60% of the total respondents has been operating for less than 11years and this indicates that the use of the space for illegal motor park is not recent, but not too long when compared to Motor Park A. However, the use of the spaces for illegal Motor Park in Motor B has been intensified due to the high level of patronage of the motor park by the commuters.

There exist variations in the vehicle used for operation in the motor parks, and the data collected from the sampled respondents on the type of vehicle used for operation in the motor parks revealed that eighteen (18) respondents out of the thirty (30) respondents sampled used cars for their operation in Motor Park A, representing 60% of the total percentage of the respondents sampled, while the remaining twelve (12) respondents, which accounted for 40% of the total percentage of the sampled respondents used buses for their operation in the Motor Park. For Motor Park B, twelve (12) respondents used tricycle for their operation, and this represents 40% of the total number of respondents sampled, while the remaining eighteen respondents make use of car and buses at ratio 1:1.

It was further revealed cars are used more by the transport operator in Motor Park A when compared to Motor Park B, while tricycle has the highest percentage of usage as the means of transportation in Motor Park B, when compared to other means of transportation in the motor park.

A total of twenty-one (21) transport operators, representing 70% of the total percentage of sampled respondents in Motor Park A made less than 3 trips in a week, while for Motor Park B, a total of twenty-four (24) respondents, representing 80% of the total percentage of sampled respondents made 3 trips and above, with operators of tricycle having the highest number of respondents of twelve (12) in this cohort.

The Socio- Economic Characteristics of the Commuters (Users of the Illegal Motor Parks)

The socio-economic characteristics of the commuters (that is the users of the illegal motor parks are considered germane to this research as issues such as the gender, age, educational background, employment status and income levels have bearings to the determination of the use of the illegal motor parks. It is important to note that these variables are examined from the view point of the researcher which is premised on the outcomes of this empirical observation. However, the cross examination of these variables provides the basis for the rationale behind the choice of these illegal motor parks, which can be term to be the decision to use these motor parks, or the decision not to use the authorized motor park.

Utilization of Illegal Motor Parks

The utilization of the illegal motor parks is measured in terms of the level of patronage of the motor parks. Motor Park A is the motor park located at the Sango Ota road intersection to Ijoko corridor, while Motor Park B is the motor park located at the Sango Ota road intersection to Abeokuta corridor, and Motor Park C is the motor park located at the Sango Ota road intersection to Owode corridor.

The rationale behind the choice of the motor parks when compared to the other legal motor parks is fundamental to this study, as this provides the basis for making proper recommendations. For Motor Park A, forty-two (42) respondents' reason for the choice of the motor park is hinged on its closeness to their origin for making the trip and also cheaper when compared to the other legal motor park, and this number represents the highest number of respondents with 56% of the total number of percentage of sampled respondents of the motor park. For Motor Park B, thirty-eight (38) respondents' reason for the choice of the motor is the closeness to their origin for making the trip, and this accounted for 51% of the total percentage of the sampled respondents of the motor park.

The Effects of the Illegal Motor Parks on Traffic Flow

The effects of illegal motor parks are numerous as the emergence of limited space for vehicular/ pedestrian movement caused by the illegal motor parks; due to road encroachment have both physical and socioeconomic negative consequences. The capacity of road intersections is greatly reduced when illegal motor parks are in existence along the corridors. For the purpose of this research, two (2) negative consequences are been identified and examined based on the empirical observations. The add-travel time spent by the drivers plying the corridor due to the emergence of the illegal motor parks, the vehicular/pedestrian conflicts due to the limited space for movement, and the emergence of hawking at the illegal motor parks are identified and examined.

Added-Travel Time

The added-travel time is the time added due the delay that occurs in the traffic. The existence of the illegal

motor parks has limited the space provided for the free flow of vehicles along the corridors of the intersection, and this has resulted into travel delay which is better expressed as add-travel time. Empirical investigations carried out reveal that during the peak hours of the day, that is; 7:45am – 8:45am and 4:30pm – 5:45pm during the working week, an average of 16 minutes added-travel time is used by motorists at the intersection, while during the peak hour of Saturday, that is 5:30pm – 6:45pm, an average of 24 minutes add-travel time is used by motorists at the intersection.

It is important to note that many factors are responsible for the delay in travel in the study area, and these factors include the land use composition of the area as a central business district and the significance of the corridors of the intersection to the Ogun State. However, the existence of the illegal motor parks has resulted delays in traffic due to the encroachment of the space provided for traffic flow, by different categories of vehicle for the purpose of motor park services.

Vehicular / Pedestrian Conflicts

One of the most visible consequences of the existence of the illegal motor park is the vehicular/pedestrian conflict, which has the potential of resulting into accident. Although the accident rate for this occurrence is not provided by the organisation in charge of managing such conflict, but data on major conflict were collected from thirty (30) pedestrians, as sampled respondents from each of the two (2) corridors where the illegal motor parks are in existence, that is, the Sango Ota road intersection to Abeokuta corridor and the Sango Ota road intersection to Owode corridor.

Data collected revealed the occurrence of Vehicular/Pedestrian conflict on the two corridors. Although the sixteen (16) respondents (pedestrians) without conflict experience out of the thirty (30) respondents shows a high percentage with 57% on the Sango Ota road intersection to Abeokuta corridor, the fourteen (14) out of thirty (30) respondents representing 47% of the total percentage of sampled respondents (pedestrians) with major conflict experience with vehicle on the road where the illegal motor parks are located, should be considered highly significant, as such occurrence has led medical treatments of different categories.

However, nineteen (19) respondents (pedestrians) representing 63% with major conflict experience on the Sango Ota road intersection to Owode corridor, revealed a high percentage, when compared to those without conflict experience, and one of the factors responsible for this rate of conflict is the high traffic intensity on the corridor, and such occurrence has required medical attention.

Emergence of Hawking

Hawking along the roads is as a result of many factors, which the existence of motor parks along the roads is inclusive. However, the study area is characterized by a commercial land use which is complex in nature owing to its high level of intensity. The existence of illegal motor parks have intensify the level of hawking at the motor parks due to the demand of the commuters to buy some items that can be easily sold along the roads. It is important to note that the emergence of hawking at the motor parks has contributed to the disposal of waste on the roads, thereby resulting into the blockage of the drains and consequently leading to flood during torrential rain burst.

4.0 CONCLUSION

The existence of illegal motor parks in the study area has resulted into various environmental problem of different magnitude. The study area has a unique characteristic owing to the fact that it has roads which form an intersection, and this characteristic has reflected in the outcomes of the empirical studies. However, the data collected on the traffic volume through traffic counts, the parking concentration and parking volume of the two illegal motor parks, and the operations of the illegal motor parks have shown that the motor parks have high intensity of usage while the assessment of their effects have revealed negative consequences of high magnitude on the environment. It should be noted that three major resultant effects of the existence of the two illegal motor parks are identified and examined in this study, namely; the add-travel time spent by motorist; the vehicular/pedestrian conflict; and the emergence of hawking and these effects are high during the peak period of traffic flow. Hence, the following recommendations are made;

i .The redesigning and redevelopment of the of legal motor park to accommodate both the inter-state and intra-city transport system. This redesigning should take into cognisance the need to segregate parking by factors such as the types of vehicle and their destinations. In order to optimize the exiting space, a good motor park design is desirable. The adherence to motor park design principles and standard is fundamental to the achievement of good motor park environment. However, the provision adequate motor park facilities will attract prospective users of the motor park, and thereby enhancing its functionality.

ii. The implementation of the redevelopment of the motor park should be in phases with appropriate

timing while a synergy between the state and the local government should be in place for both the financing and management of the motor park. The illegal usage of the spaces for motor parks should be stopped, and such stoppage should be enforced by appropriate government authority. The stoppage of the use of the illegal spaces for motor park services will enhance the flow of traffic and eliminate the menace that has been created by the illegal motor parks. Monitoring and Review are major aspect of planning process, hence the implementation of the redevelopment plan of the motor park should be properly monitored, and the plan should be reviewed at the time specified by the project developer.

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Experimental

ASSESSMENT OF LEVEL OF PARTICIPATION IN RECREATIONAL ACTIVITIES IN FEDERAL POLYTECHNIC, ILARO OGUN STATE

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Abstract

The basic relevance of recreation makes it a very significant phenomena. Every society's sociocultural, economic, and physical development is significantly influenced by it. The benefits of recreation to people also include bettering their physical and mental health. In this paper, the level of recreational activity engagement at the Federal Polytechnic Ilaro, Ogun state is evaluated. The study used both secondary and primary data, which brought about increased understanding of the value of recreation. Descriptive survey design was adopted for the research, and 100questionnaires were used to gather data from the respondents. The respondents were drawn from the polytechnic's faculty, students, and visitors who frequently stopped by the campus to enjoy some of the recreational amenities. The results of this study showed that recreation is prioritized at Federal Polytechnic Ilaro, where a range of recreational facilities are available for use by the school personnel, students, and visitors who reside nearby. In addition, the study revealed majority of polytechnic residents have a tendency of routinely engaging in recreational activities, with most of them doing so at least three times each week while enjoying various recreational facilities on the school grounds. The research, however, clearly demonstrated that there are some factors that can discourage people from recreation. In Federal Polytechnic Ilaro, it was discovered that distance and financial constraints are some of the main barriers preventing people from engaging in recreational activities.

Keywords: Assessment, indoor, outdoor, participation, recreation

1.0 INTRODUCTION

Everyone requires recreation, which is as old as man himself. This is as a result of its enormous and essential relevance. It is crucial to the human race's physical, economic, and sociocultural progress. (Okoli 2001). Based on this, Obateru (2003) asserts that Nigerians should engage in recreational activities to enhance their health, boost their economic production, and make worthwhile use of their free time. According to Atemie (1997), leisure time activities are a crucial component of a long life. Recreational activities are known to calm or reform the mind, relieve stress and anxiety, lessen sadness and loneliness, and enhance self-esteem or confidence. The value of leisure in improving one's quality of life has been underlined (California State Parks, 2005). However, it has been noted that the culture of consciously engaging in recreational activities is very low in Nigeria. This might have anything to do with the country's current economic situation. According to studies on Nigerians' leisure activities conducted in various spheres of life (Makasi, 2008; Imazobi, 2008), a majority of Nigerians appear to be discouraged from participating in leisure activities due to a number of unexpected circumstances. There are many different kinds of contemporary recreational amenities at Federal Polytechnic Ilaro in Ogun State, yet it is perceived that the usage of these facilities might not seem to be what one may expect. This discovery was made during a preliminary survey that the researcher conducted which revealed that there may be very little leisure activity involvement.

Despite the multiple options and numerous advantages linked with recreational activities, there are signs that the level of recreational activity in Federal Polytechnic, Ilaro Ogun state is low. According to past studies, the absence of facilities is always cited as one of the main reasons people don't engage in recreational activities. According to (Mcintosh, 2014), who views leisure as having advantages for man's health, physical well-being, and environment, the issue of a shortage of recreational facilities that restricts participation in recreation has been acknowledged. Researchers like Morrison (2008) argued that one of the main factors influencing involvement in recreational activities is the location of recreation facilities. An evaluation of the level of participation in recreational activities at Federal Polytechnic Ilaro is of interest in this paper because it seems to be in conflict with the known findings about the reason for non-participation in

recreational activities in the institution given that there are numerous recreational facilities available. The study's goal is to evaluate the extent of recreational activity engagement at Federal Polytechnic Ilaro. The study specifically intends to evaluate Federal Polytechnic Ilaro's recreation facilities, assess Federal Polytechnic Ilaro's leisure activity participation trends and determine the elements that influence recreational activity participation at Federal Polytechnic Ilaro. The study also looked into why recreation engagement in Federal Polytechnic Ilaro, Ogun State, is so low despite the relative accessibility of facilities. Future policy on the supply of recreational amenities in metropolitan areas across Nigeria must take this into account. The study will assist people better grasp the advantages of participating in leisure activities, which will benefit the general public and society as a whole.
Recreation is a broad idea that varies from culture to culture and from person to person. This feature has led to the formation of many categories for recreation. Dumazedier (1989), for instance, categorizes recreational activities into five broad groups. These include activities that are "physical," like walking, sports, and traveling; "artistic," like being interested in various fine arts; "practical/applied works," like making crafts; "intellectual," like reading and expanding one's knowledge; and "social," like going out to events and seeing friends.
According to Karaküçük (2016), the classification of recreation is based on the reasons why an individual engages in recreational activities, as well as on the individual's preferences and wishes. An acceptable recreation type is developed based on the factors that influence a person's decision to engage in a particular recreational activity. Within these constraints, Karaküçük classified recreation according to its goals (leisure, cultural, social, sporting, touristic, and artistic), as well as according to a number of other factors. (age, number of participants, time, space, and social). Similar to Karaküçük, Hazar (2003) argued that factors like purpose, space, and function should be used to classify different types of recreation. She then categorized recreation into six categories using the findings from Duncan (2004) and Akesen's investigations (1978). Hazar claims that several leisure pursuits fall under more than one category. For instance, sports like golf and kayaking could be classified under the spatial category "outdoor recreation," as well as the functional recreation type category "sportive recreation."

Benefits of Recreational Activities

There is a substantial and expanding body of research that demonstrates the numerous advantages of leisure activities for people, communities, the environment, and the economy.
Recreational areas are fantastic motivators for exercise. Physical activity is made fascinating, engaging, and encourages lifelong fitness habits. **Decreased obesity, decreased illness risk, improved immune system,and reduced depression** are just a few of the many health benefits of recreation that have been scientifically shown.

Decreased obesity

An epidemic of obesity has emerged. Obesity is still a serious health issue and is closely related to inactivity. Obesity and/or overweight are linked to a higher risk of disease, mortality, and chronic medical disorders such as arthritis, gallstone disease, gallbladder disease, hypertension, diabetes, and several malignancies.
Activities that involve exercise can fight obesity. The Call to Action by the Surgeon General to Prevent and Reduce Overweight and Obesity 2001, a report from Health and Human Services, brought national attention to the link between recreational activity and health. (HHS, 2001). This paper highlights the advantages of increased physical activity and links weight problem to the requirement for institutions to offer appropriate play area and recreational options.

Decreased risk of illness

The risk of several major diseases is also greatly lowered by recreational activities. According to the Surgeon General's review on bodily undertakings and fitness, millions of Nigerians suffer from illnesses that might be avoided or whose symptoms can be lessened with more physical exercise.

Heart Disease

Heart disease and other forms of cardiovascular disease are major killers. Obesity, diabetes, and a absence of human occupation are three of the primary elements that can lead to heart disease. By engaging in regular physical activity and aerobic exercise, obesity and diabetes can be significantly reduced. If done consistently, recreational activities like jogging, rapid hiking, swimming, and biking are great for raising pulsation and reducing the risk of cardiac infarction, plumpness, and diabetes.

Cancer

Another major cause of mortality in Nigeria is cancer, which is followed by heart disease. According to the Nigerian Cancer Society, 32000 new cases of cancer was experienced in Nigeria and 22,200 fatal cancer cases in 2003. 25 out of 33 papers investigating the connection between real occupation and colon cancer

show that people that work-out have a reduced tendency of colon cancer than their inactive peers (Law, 2003). Living an active lifestyle has been demonstrated to reduce the risk of site-specific malignancies, including those of the colon, breast, and lungs.

Enhanced Immune System

A healthy individual is less prone to sickness. Energetic adults procure reduced medical costs yearly than unenergetic people, according to a Center for Disease Control and Prevention study. Active people used fewer medications, visited their doctors less frequently, and spent less time in the hospital. Compared to non-exercisers, people who worked out for 20 minutes weekly were considerably less likely to be sick. An Oklahoma State University research that followed 79,000 adults for 12 months found that people who trained at least two times a week came to work more frequently (Mooney et al., 2002). A study of 547 adults found that those who were consistently agile had a 23% reduced case of upper respiratory tract infections than those who were not (Nieman, 2001). Rural recreational grounds and leisure users report less doctor appointments than non-park users for reasons other than checks. (Ho et al., 2003).

Reduces Depression

There are many different manifestations of depression which is a mental condition. The signs and symptoms include thoughts of suicide, feelings of worthlessness, hopelessness, and despair as well as intense, uncontrollable sadness. A typical depressed individual cannot adequately function or participate in everyday undertakings for about one month and a week out of the year (Kessler, 2003). 12,350 individuals perpetrated self-murder in 2000 due to depression, which puts it as the third most common cause of mortality in America for people aged 15 to 24 (Minio, et al. 2002). Activities for leisure and recreation might lessen depression. People who engage in recreational activities get to encounter things they enjoy and look forward to. Recreational activities also lessen depression-causing feelings of alienation, loneliness, and isolation.

2.0 MATERIALS AND METHODS

The paper employed a descriptive survey research design as its methodology. The people of the Federal Polytechnic, Ilaro, Ogun State, made up the study's target population. Random sampling technique was utilized to reduce the research population. The respondents received a total of 100 questionnaires, which were dispersed at random. The statistical package for social sciences (S.P.S.S.) was put to use in analyzing the data gathered for this study, and tables, frequency counts, percentages, and other descriptive statistical tools were used to illustrate the results.

3.0 RESULTS AND DISCUSSION

The availability of recreational facilities at the federal polytechnic in Ilaro, patterns of recreational activity participation, and factors influencing recreational activity participation were all examined and reported chronologically.

Table 1: Availability of recreational facilities

Variables	Strongly Disagree (%)	Disagree (%)	Undecided (%)	Agree (%)	Strongly Agree (%)	Total (%)
Federal polytechnic Ilaro has variety of Recreational facilities	5	15	15	34	31	100
Recreational Facilities in Federal Polytechnic Ilaro is Sufficient	3	10	15	17	55	100
Federal Polytechnic Ilaro Management encourages the use of recreational facilities	2	8	11	51	28	100
Federal Polytechnic Ilaro Organizes activities that gives people opportunity to recreate	3	5	12	26	54	100

Federal Polytechnic Ilaro gives room for students to make use of recreational activities in the school	4	7	25	44	20	100

Source: Authors Field Survey (2022)

Table1 above reveals that 34% of respondents agreed and 31% strongly agreed that federal polytechnic Ilaro has a variety of recreational facilities, while 5% of respondents strongly disagreed, 15% disagreed, and another 15% of respondents were undecided. This demonstrates that the respondents believe the federal polytechnic Ilaro has a wide range of leisure amenities. The table also reveals that 10% of respondents disagree, 3% strongly disagree, 15% were unsure, whereas 17% of respondents agreed, and 55% of them strongly agreed that recreational facilities at federal polytechnic Ilaro are sufficient. This demonstrates that the respondents believe the leisure facilities at federal polytechnic Ilaro are adequate. The table also reveals that 28% strongly agreed that Federal Polytechnic Ilaro management encourage the use of recreational facilities, while 2% strongly disagreed, 8% disagreed, 11% were undecided, 51% agreed, and 28% strongly agreed. This data demonstrates that respondents believe Federal Polytechnic Ilaro management encourage the use of recreational facilities. The table shows that 3% strongly disagree that Federal Polytechnic Ilaro organizes activities that give people the chance to relax, 5% disagree, 12% were unsure, 26 percent agreed, and 54 percent strongly agreed. This demonstrates how the federal polytechnic Ilaro provides opportunities for recreation through the planning of events. From the table, it can be inferred that 4% of respondents strongly disagreed, 7% disagreed, 25% were unsure, 44% agreed, and 20% strongly agreed that Federal Polytechnic Ilaro gives students the opportunity to participate in recreational activities on campus. This indicates that the federal polytechnic Ilaro provides space for students to engage in leisure activities.

Table 2: Pattern of participation in recreational activities

Variables	**Strongly Disagree (%)**	**Disagree (%)**	**Undecided (%)**	**Agree** (%)	**Strongly Agree (%)**	**Total (%)**
How often do you participate in recreational activities	Once a week 7	Thrice a week 45	Everyday 29	Never 19	_	100
You feel enlightened while participating in recreational activities	1	6	29	33	31	100
You engage in more than one recreational activity within a week	1	13	14	20	52	100
Participation in recreational activity has a positive influence on the development of skills and competence in federal polytechnic Ilaro	1	3	21	39	36	100

Source: Authors Field Survey (2022)

According to (Table 2 above,) 29% of respondents recreate every day, 45% participate three times per week, 7% participate once per week, and 19% do not participate in any recreational activities. This shows that the majority of respondents engage in recreational activities three times per week. 1% strongly disagree, 6% disagree, 29% were unsure, 33% agreed, and 31% strongly agreed that engaging in recreational activities makes them feel enlightened. Therefore, it can be concluded that those who attend federal polytechnic Ilaro are becoming more informed as they engage in leisure activities. 1% of respondents strongly disagree that they participate in more than one recreational

activity every week; 13% disagree; 14% are unsure; 20% agree; and 52% definitely agree. This demonstrates that many of the respondents engage in multiple leisure activities throughout the course of a week. 1% strongly disagree, 3% disagree, 21% were unsure, 39% agreed, and 36% strongly agreed that participation in recreational activities has a positive influence on the development of skills and competence in Federal Polytechnic, Ilaro. This indicates that, in the opinion of the respondents, recreational activity participation has a positive impact on the development of skills and competence in this institution.

Table 3: Factors influencing recreational activity participation

Variables	Strongly Disagree %	Disagree %	Undecided %	Agree %	Strongly Agree %	Total %
Lack of finance hinders people from participating in recreational activities.	2	4	20	52	22	100
Distance affects participation in recreational activities.	1	9	17	11	62	100
People with disability are less likely to engage in in Recreational Activities	2	7	23	51	17	100
Religion affects participation in recreational activities	2	11	15	10	62	100
Time constraint affect participation in Recreational Activities	6	21	11	52	10	100

Source: Authors Field Survey (2022)

According to the respondents, 52% agreed and 22% strongly agreed that lack of finance hinders people from participating in recreational activities, while 2% strongly disagree, 4% disagree, and 20% were undecided. This proves that financial barrier prevents students at Federal Polytechnic Ilaro from participating in recreational activities. The table also reveals that according to the respondents, 11% agreed and 62% strongly agreed that distance influences participation in recreational activities, while 9% disagree and 17% are unsure. However, 1% strongly disagree and 9% disagree that distance impacts participation in recreational activities. This shows that travel time has an impact on recreational activity participation. From the table, it can be inferred that 2% of respondents strongly disagree that people with disabilities are less likely to engage in recreational activities, 7% of respondents disagree with this opinion, 23% were unsure, and 51% and 17% of respondents agreed that this is the case. This demonstrates that individuals with disabilities are less likely to participate in leisure activities. The data shows that 10% agreed and 62% strongly agreed that religion affects involvement in recreational activities, whereas 2% strongly disagree and 11% disagree with this attitude. Meanwhile, 15% were undecided. This suggests that, in the case of Federal Polytechnic Ilaro, religion has a part to play in terms of engagement in leisure activities. Regarding the time factor, the respondents indicated that 52% agreed and 10% strongly agreed that time constraints affect participation in recreational activities, while 6% strongly disagreed and 21% disagreed with this view. However, 11% were undecided about it. This indicates that one of the main reasons why people in Federal Polytechnic Ilaro refrain from engaging in recreational activities is a lack of time.

Discussion

The results of this study showed that the federal polytechnic Ilaro takes recreation seriously because the school offers a variety of recreational facilities that are used by both the employees and students of the institution as well as people who live nearby. The Federal Polytechnic Ilaro Management also promotes the use of recreational amenities on campus because many of them are open 24/7, which encourages engagement in recreation by both faculty and students at the polytechnic. The research, however, clearly demonstrated that there are some things that can discourage people from recreation. In addition to distance, it was discovered that one of the main barriers preventing people from engaging in leisure activities in federal polytechnic Ilaro is financial constraint.

Some of the students and personnel of the institution were unable to use some of the recreational facilities on the school grounds because of the far distance of the school from their homes. Additionally, it was revealed that the majority of polytechnic residents have a tendency of routinely engaging in recreational activities, with most of them doing so at least three times each week while enjoying various recreational facilities on the school grounds. Furthermore, it was discovered that most of the residents at Federal Polytechnic Ilaro experience mental clarity and are typically calmer after partaking in any sort of recreational activity, therefore people feel more enlightened while engaging in recreational activities.

4.0 CONCLUSION

The Federal Polytechnic Ilaro's recreational activity participation was evaluated in this study. The results showed that most of the respondents had participated in a variety of leisure activities at some time in their lives. Relaxation was the main driver for involvement. The results of this study indicate that faculty and employees at federal polytechnic Ilaro are interested in and frequently participate in leisure activities.

However, the respondents' insufficient financial resources are a significant factor limiting their engagement in recreational activities. Another factor limiting their participation in recreational activities was distance. Additionally, it was determined that inadequate facilities and equipment provision was a factor affecting residents of the federal polytechnic Ilaro's involvement in recreational programs.

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Experimental

ATTITUDE OF SURVEYING PRACTITIONERS BASED ON PERCEIVED EASE AND USEFULNESS OF TECHNOLOGICAL INNOVATION

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ABSTRACT

This study examines Nigerian surveyors' attitudes and perceptions on the ease of use and usefulness of technological innovation using the Technology Acceptance Model and Unified Theory of Acceptance and Use of Technology. The manifests of the psychometric response scale questionnaires were converted into numbers through Microsoft Excel and then analyzed using structural equation modelling (SEM) in SmartPLS 3v. The population used for this research are mainly two categories of professionals within the states of Lagos, Ogun, and Oyo. A stratified random sampling was used to sample the eight-two (82) questionnaires returned. The measurement establishes the casual effect of the indicators and variables on the latent construct and the relationship between endogenous variables and exogenous variables. For this study, the model fit statistics were obtained where the standardized root mean square residual (SRMR) was 0.068, which was accepted as a good fit. The item loadings are well above 0.7, with the AVE above 0.5 as a measure of the effects. The construct reliability and validity have values higher than 0.7. As a result, attitude is influenced more by perceived usefulness than perceived ease of use. Two (2) hypotheses were tested, but only PUP-ATT was significant with a P-value of 0.000. PSP-ATT has a P-value of 0.4 on attitude. The results reveal the impact of perception on surveyors' attitudes toward using modern technology in their professional practice. This has limited the use of sophisticated surveying instruments and IT techniques to automate mapping processes by many practitioners.

Keywords: Attitude, modelling, smartPLS, perceived usefulness, technology,

1.0 INTRODUCTION

In Nigerian parlance, surveyors are qualified practitioners who engage in the scientific measurements and delineation of spatially referenced features for proper description, representation, and definition that aid planning and decision-making (Ben and Ashang, 2010). A surveyor is required to be skilled in these arts to deliver such services to the required standard or specification. However, a professional in this context requires a level of knowledge and expertise to accomplish such tasks as defined by the International Federation of Surveyors (FIG). Advancement in technology has aided faster and more reliable measurement due to the automation and electronic capacities of surveying instruments such as the Global Positioning System (GPS), laser scanners, smart stations, etc. (Roberts, Dodson, and Ashkenazi, 1999) and mosques (Moselhi, Bardareh, and Zhu, 2020). This study has a tendency to assess the extent of proficiency of surveyors to apprehend how using technology and its perceived usefulness and ease of use have influenced their attitudes and behaviours toward practice (Altawalbeh, Fong, Thiam, and Alshourah, 2019). In a bid to encourage surveyors' participation in the current technological processes, the bodies regulating the profession engage in quarterly mandatory continuing development programs to give surveying practitioners state-of-the-art training on the automated surveying processes. It was, however, discovered that not so many surveyors are interested in the innovations. In ongoing research, it was encouraged to study the interest of these practitioners by evaluating their attitudes while considering causes or factors driving such a disposition towards technological innovations. A review of past literature revealed that there are a few studies on the attitude of practitioners towards accepting a technology; although some studies have identified factors causing attitudinal behaviours, none have expressly discussed the attitude of surveying practitioners toward the use of technological innovations. Consequently, the main objective of this paper is to examine factors affecting the attitude of surveying practitioners towards the use of technological innovations. Structural Equation Modelling (SEM) is a statistical tool proficient in examining the correlation and impact of indicators on the variables they measure. Variables measured in this study: attitude (dependent), perceived ease of use, and perceived usefulness (independent) were examined for correlation, causal

effect, and validity to ascertain hierarchically indicators that influence them.

Research Hypotheses

Grounded in the theoretical components and parameters of the Technology Acceptance Model (TAM), this research has the following hypotheses with major concerns for the attitude of practitioners based on PUP and PSP:

H1. Perceived ease of use (PSP) has a positive effect on attitudes towards using technological innovation.

This will reveal the causal effect of how one's opinion about the ease involved in using technology in professional practice. It will further establish the weight of PSP on attitude towards use.

H2. Perceived usefulness (PUP) has a positive effect on the attitude towards using technological innovation.

In this hypothesis we look forward to seeing the influence of perceived usefulness (PUP) on attitudinal behaviour towards use.

Surveying, on the other hand, is a geosciences branch used to determine the location of features on the surface of the earth, the storing, retrieving, and managing of geographically referenced data, and the graphical and visual representation of such features on maps in digital or hard copy format. In addition, the determination of the earth's figure and gravity field uses applied mathematics and physics as a basic tool (Nwilo, 1999). A basic tool to collect and evaluate spatially referenced and geographic-related data, to use such data to represent, plan, and implement effective land, sea, and structure management, and also to promote the improvement and progress of such practices." (NIS, 1997).

Practitioners

To define "professional" or professionalism," many authors have different views and definitions as an argument on consensus that professionals are persons in organizations who have attained professional status of higher powers and levels due to specific skills and proficiency in corporate bodies of knowledge (Oduwole, 2021) (Larson 1977; Sharma). Therefore, the major distinctive characteristic of professionals is the authorization they solely possess and utilize.

A land professional is an individual authorized and enlisted by recognized laws to practice the acts of land surveying. A professional surveyor may be required to carry out engineering surveys but delimited from other branches of engineering (Ezeomedo, 2019).

Formal study in surveying education for intending surveyors is now generally considered, but it is not always so. An alternate route to this is apprenticeship training, a practical way to become a surveyor. Many other trainees chose apprenticeship because of the monetary gains it offered even without formal education, so they remain unqualified. (Fajemirokun, 1976).

Different authors emphasized other aspects of professionalism. An example was Larry Bell, who claimed that generally, the context of professionalism revolves around standards, status, character, and approaches. Hence, professionalism goes by ethics and the rules of law (Oates, 1993). Hanlon, a proficient writer on the theme, uses the notion to examine the tussles and agitations in careers (e.g., law, medicine) and within other societies, mostly the state province and private capital.

The use of information technology necessitates a high level of understanding, which has limited the scope of many individual practitioners. The rejection of information technology can be linked to a number of variables, including ease of use, usefulness, and attitude (Awosejo, Kekwaletswe, Pretorius, and Zuva, 2013).

Using a variety of models and theories, many studies have discovered the elements that influence one's intention and perception of engaging in professional activity. Intention and perception in surveying parlance have not been adequately captured to determine their influence on actual behavior towards practice. Structural Equation Modeling, as an ideal analytical method, has opened up new avenues in research, attracting a lot of interest.

Technological Innovations in Surveying

Space science and technology have changed conventional spatial information gathering, and internet technology helps to disseminate huge amounts of information in real-time. The advent of communication technology, especially personal communication, has improved life and service delivery. Multimedia systems offer the opportunity to obtain structured information in new and innovative ways. Automated systems free the workforce for other, more productive actions. The geomatics engineering or surveying profession has been ominously impacted by these new technologies (Trinder and Han, 1999).

With such a sound foundation and professional history, someone could expect the highest professionalism and strict compliance with principles from the new-age surveyors. Conversely, this is hardly the situation. Recently, the behavior and conduct of the new day surveyor in Nigeria have been queried, mostly in areas of cadastre and service delivery (Akinola and Ojo, 2014).

Continuous Professional development and technical knowledge equip anyone with opportunities for skill acquisition and update at any later stage in their career, but the theoretical problem-solving skills and application achieved are mainly achieved through academic training at higher institutions of learning. Advancement, preservation, and improvement of professionalism ought to be a complete development expedited through an effective collaboration of research, educational skill, and professional practice (Adeoye, 2007).

Information system development is vital to every discipline. The power of an information system is determined by its capability to spread widely enough to reach individuals for whom the information is useful. Consequently, the development of information systems requires expertise from many disciplines. Due to the influence of IT, equipment will become smarter, conserving energy, and people will be freer to accomplish more intelligent and menial goals. However, this means there will be new

employment opportunities that will increase exponentially and significantly in scope or interest (Evangelista and Savona, 2003; Bermant, 1995).

Advances in technology and globalization have obligated surveying to take a multi-disciplinary approach. Nowadays, one do profession do encroach into others due to globalization as there no definite professional boundaries plausible anymore (Liu, 2008).

Regulatory and professional authorities should work to expand the breadth of surveyor training in Nigerian educational institutions to include new courses in digital instrumentation, computerization, geographic-based information technology, satellite and image technologies, and environmental analysis and modelling. This improvement will promote surveying in Nigeria to align with the technological trends of the world, transforming it from an orthodox and customary practice to a modern system.

Theoretical Framework

UTAUT

The unified theory of acceptance and use of technology (Chao, 2019) is a body of knowledge that aids in examining indicators and factors that affect intention and perception through models designed and theorized with TAM (Technology Acceptance Model) Theory of Reasoned Action (TRA), and TPB (Theory of Planned Behavior) (Idoga, Toycan, Nadiri, and Elebi, 2019).

This study is imperative in contextualizing the behavioral intentions of surveying practitioners to understand their views on technological innovations and their usefulness to surveying activities.

The unified theory of acceptance and use of technology (UTAUT) model is universally accepted. Venkatesh et al. (2003) developed it by reviewing studies on technology adoption theoretical models. Moreover, the theoretical model is extensively used to explain perceptions of technological innovation.

Technology Acceptance Model (TAM)

TAM, developed by Davis in 1989, is an icon among the latest research models employed to examine the acceptability of information systems (IS) and technology. In TAM structure, the two (2) major factors that affect the intention to use information technology are perceived ease of use and perceived usefulness (Echchabi, Al-Hajri, and Tanas, 2019).

Attitude

Attitude is a indicator used to predict BI (Muñoz-Leiva, Climent-Climent, Liébana-Cabanillas 2017; Zolait, 2010). Attitude (ATT) is different from behavioral intention (BI) in terms of realization, but both consist of disposition (Rummel, 1976). Attitude has proof that it has strong relationship with Behavioral intention. Attitude is the user's behavior towards the new behavior or technology and his or her acceptance of it positively or negatively. Ajzen and Fishbein (1991) showed that a person's perception influences his or her behavior towards using a system at first time. As said earlier, attitude indicates how an individual thinks about the benefits of technological innovation, its perceived usefulness, and its characteristics. Attitude measures the possible result of engaging in a particular behavior, which leads to varying choices due to different measures of such behavior. This reveals whether an individual's perception of technology is negative or positive.

Perceived Ease of Use

Davis (1993) described Perceived ease of use as "the degree to which using a specific technology will be free from effort". In this study, perceived ease of use is said to be "the degree to which the perception of practitioners influences their attitude and behavior towards using technological innovations in surveying practice." Previous works supported the idea that there are constructive relationships between PSP and ATT, PSP and PUP, and behavioral intention to use. In addition, perceived ease of use is an outstanding element of perceived usefulness and attitude towards using technological innovations (Joo and Choi, 2015). Furthermore, Sheikhshoaei and Oloumi (2011) found the same for librarians' IT acceptance.

Perceived ease of use explains the degree to which it is believed that a system type would be stress-free when used (Davis, 1989). In other words, perceived ease of use refers to the conviction that a system is not cumbersome or requires little effort when used.

The distinguishing feature between the PUP and PSP is the user affability of the technology and the perceived usefulness is the acceptability of the fact that the system helps in achieving daily tasks.

The previous studies on the relationship between PSP and ATT are very clear. Davis, Bagozzi, Warshaw (1989) postulate that increase in perception of ease of use results in positive attitude towards use of technology (Wang, Wang, Lin, Tang, 2003 and Celik, 2008). However, in some others studies this assertions are negative as there are no support for such relationship (Tan, Chong, Ooi, Chong 2010; Ernovianti, NM Kamariah, Rashid and Meor Shaari 2012). This basically means the sample is already versed in using the aforesaid technology.

In mobile banking, the PSP (perceived ease of use) is related closely to the establishment of definite and user friendly features on mobile banking application and website. An uninterrupted banking services outside regulated banking periods is a highly valuable development. Other features in the banking applications are effectiveness, reliability, responsiveness, friendliness and operability. Individual user's confidence can be boosted through effective security and policies. Therefore, reliability and benefits in these applications will definitely increase adoption of technological innovations. This invariably means that user's attitude and intentions are dependent on the applications' feature usability.

Perceived Usefulness

Perceived usefulness as a TAM construct was introduced by Davis (1993); it was stated as "the perceived extent at which it is believed that using a particular system or service will enhance their job

performance" (Davis, 1989). Chang (2013) acknowledged perceived usefulness as performance expectancy. This was confirmed in his mobile library apps work that was used to find university libraries' data and to know how improvement in work performance can be effected. Consequently, their use intention is stronger. Kim (2014) reported that there is a positive relationship between perceived usefulness and the intention to use mobile library services.

According to Sondakh (2017) the TAM model shows that a person accepts a system if they believe in it, the construct of perceived ease is then confirmed to be a significant construct affecting the adoption of any system.

The description of PUP by Davis et al. (1989) was also broadly replicated and adapted. PUP was described as one's subjective assessment on the viability of using a technology in boosting individual's performance in their jobs. Perceived usefulness (PUP) entails the user's perception on how online banking applications enhance profit and banking performance (Davis, Bagozzi, and Warshaw, 1989, Davis, 1989). Similarly, online banking improves banking performance through uninterrupted and easy access to banking features which saves energy, time and money among others.

2.5 Structural Equation Modeling

Structural equation modeling (SEM) is a statistical method that permits the evaluation of causal relationships that exist between variables (independent and dependent) in one-many or many-many scenarios. There are different ways to define SEM, but it is generally perceived as a hybrid tool for analysis of variance (ANOVA), regression, and factor analysis (Tarka, 2018).

2.0 RESEARCH METHODS

This paper evaluates surveyors' behavioral intentions to use technological innovations available for surveying practice. To achieve this, questionnaires were distributed to target groups in the surveying society, and the responses were transformed (coded) to fit the software for analysis.

Materials Used

The main material used is responses and primary data obtained from questionnaires distributed to a targeted audience. Google form was used to distribute questionnaires to respondents through mails. Many mails were returned half completed and others completed. The data obtained were then refined through Microsoft excel package, this was done to format the data and input in to SEM statistical tool for further processing.. The study engaged selected surveyors in some southwest Nigerian states. The sampling method used to administer the questionnaire was stratified random sampling and divided into firms. Consequently, about ninety copies of the questionnaire were returned, and after sorting and filtering, only eight-four (84) responses were utilized. This was found to be adequate since the number of arrows to the latent variable was less than eight (8) (Wong, 2013).

This study combined the qualitative and quantitative reporting techniques; it involves statistical and explanatory notes attached specified constructs and results obtained. SmartPLS was utilized to analyze the data obtained through the path modelling partial least square structural equation modeling (PLS-SEM) tool.

In the survey, the participants are n = 97 comprising academic and practicing surveyors within the three (3) states with ages ranging from 18 to 84 years plus. The class with the largest age group is 24 to 44 years old as 68.6%. They were well educated with moderate income.

Marcoulides and Saunders (2006) stated the minimum sample size required in study ultimately depends on the maximum number of arrows indicating a latent variable as specified by the structural equation model. So, in this study 91 respondents was adopted as sample size due to the number of arrows. This was based on a 95% confidence interval and an alpha level of 5%.

The Structural Equation Modelling – Model Quality Evaluation

The Partial Least Squares Structural Equation The modelling system, comprising the modelling workspace, algorithm, and system packages, is a second-generation multivariate statistical tool. It is a variance-based system employed in instituting structural relationships between exogenous and endogenous latent constructs. In other words, it evaluates relationships within research constructs and variables, tests research propositions, and makes scientific interpretations with empirical conclusions (Oduwole, 2021).

3.0 RESULTS

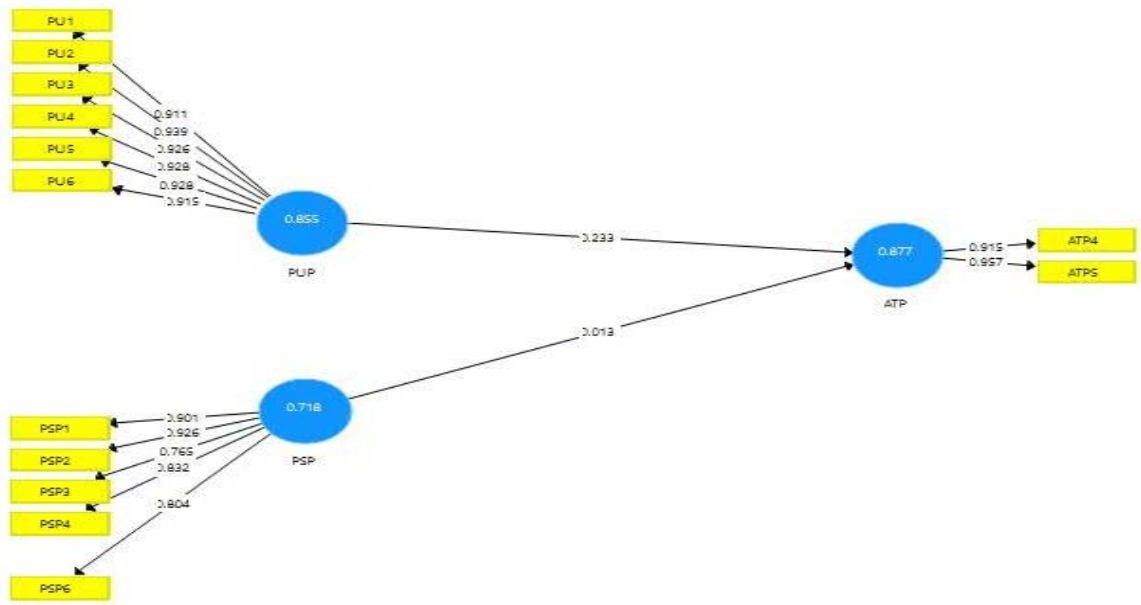

Figure 1: Measurement model

According to past literature, the measurement model is tested through the item's reliability using loadings, internal consistency using Cronbach's alpha () and composite reliability (CR), convergent and discriminant validity using Fornell Larcker, and heterotrait-monotrait ratio (HTMT) (Abdul Rahman et al., 2013; Hair, Sarstedt, Ringle, and Mena, 2011; Murtala, Onukwube, and Yahaya, 2019; Wong, 2013), while the path coefficients, the coefficient of determination (R2), predictive relevance (Q), the effect size (f2), and goodness-of-fit (GoF) of the structural model (Murtala et al., 2019; Wong, 2013); while the path coefficients, the coefficient of determination (R2), the coefficient of determination (R2), predictive relevance (Q), predictive relevance (Q), predictive relevance (Q), the effect size (f2), and goodness-of-fit

The following tables are the results from the SEM operation on the above listed tests;

Table 1: Factor Loadings

	ATP	PSP	PUP
ATP4	**0.915**		
ATP5	**0.957**		
PSP1		**0.901**	
PSP2		**0.926**	
PSP3		**0.765**	
PSP4		**0.832**	
PSP6		**0.804**	
PUP1			**0.911**
PUP2			**0.939**
PUP3			**0.926**
PUP4			**0.928**
PUP5			**0.928**
PUP6			**0.915**

Table 2 Model Fit

Fit Summary

	Saturated Model	Estimated Model
SRMR	0.068	0.068
d_ULS	0.422	0.422
d_G	0.342	0.342
Chi-Square	164.312	164.312
NFI	0.860	0.860

In the square root of the sum of the squared differences (SRMR), a zero value for SRMR suggests a perfect fit, but models can have SRMR values higher than 0.05 (Henseler et al., 2014). However, a cut-off value of less than 0.08, as proposed by Hu and Bentley (1999), therefore, in this study, the SRMR is 0.068 and is considered a good fit.

For the measurement model, the significance of loadings (see table 1) and the composite reliability should be >0.7 (see table 5). Also, the average variance extracted (Kaveckis and Bechtel, 2014) is > 0.5. Model validity was assessed using the Fornell and Larcker criterion and the Heterotrait-Monotrait Ratio (HTMT) (see tables 6 and 7).

According to the main objective, the measurement and assessment model validated the relationship. The result shows that the variables used in the questionnaire are adequate for reliability and adequacy. The Cronbach alpha ranges from 0.7 to

0.9 (see table 5). As it is widely accepted that Cronbach alpha greater than 0.60 is acceptable in social sciences research (Oduwole, 2021).

Table 3: Coefficient of determination (R^2)

	R Square	R Square Adjusted
ATP	0.422	0.408

Table 4: Effect Size (f^2)

	ATP	PSP	PUP
ATP			
PSP	**0.013**		
PUP	**0.233**		

Table 5: Construct reliability and validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted
ATP	**0.863**	**0.933**	**0.934**	**0.877**
PSP	**0.902**	**0.922**	**0.927**	**0.718**
PUP	**0.966**	**0.967**	**0.972**	**0.855**

Cronbach alpha value of 0.5 is taken unreliable, but a Cronbach alpha value of 0.5 or above is suggested to be reliable. Nonetheless, cronbach alpha with value closer to one (1), a more reliable the data set is achieved.

Table 6: Heterotrait-Monotrait Ratio (HTMT)

	ATP	PSP	PUP
ATP			
PSP	**0.578**		
PUP	**0.686**	**0.784**	

Table 7: Fornell-Larcker Criterion

	ATP	PSP	PUP
ATP	0.936		
PSP	0.536	0.848	
PUP	0.644	0.743	0.925

Table 8: Hypotheses Tested

Hypothesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
PSP -> ATP	0.128	0.132	0.164	0.782	**0.434**
PUP -> ATP	0.549	0.552	0.146	3.754	**0.000**

4.0 CONCLUSION

The result has shown the effect of the attitude of practitioners towards technological innovations, the relationship between perceived usefulness and ease of use, and their effect on the attitude being modeled. The output shows the high validity and acceptability of the model. Therefore, it sufficiently explained the main objective of this study.

The result shows that the perceived ease of use of individuals has nothing to do with their attitude towards the use of technology for automating surveying practices, but it shows the high significance of perceived usefulness as an important indicator that measures attitude towards use. Perceived ease of use has no significance for attitude, showing a high P-value of 0.434 (see table 8).

However, we recommend that regulatory bodies increase visibility and showcase innovations in technology and its usefulness to their members in order to boost their knowledge of the unlimited opportunities IT provides. They should enforce the usage of technological innovations by surveyors in order to increase their perceived usefulness through training and reviewing specifications that incorporate modern instruments for service delivery.

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Experimental

DEVELOPMENT OF MICROCONTROLLER BASED BODY MASS INDEX MACHINE

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Abstracts
An essential diagnostic tool for monitoring body mass distribution with the associated health implications in humans is a Body Mass Index (BMI) machine. This widely used metric for body mass is derived from measuring human height and mass which its manual/orthodox determination is very tedious and prone to errors. This study developed a microcontroller based BMI machine for automatic, accurate, interactive monitoring means of human health. The system design was achieved through Proteus 8.9 electronic simulation application software and, the development was actualised through construction using soldering, fitting, and coupling of electronic components. Body mass load cell in a Wheatstone format with HX711 and ultrasonic based (HC_SR04 sensor) were utilised for capturing mass and height. The machine is controlled by Arduino microcontroller programmed in C language to calculate the BMI and provides confidential result (interpretation) through a dedicated SIM card of GSM Module SIM900L to a medical practitioner. The system automatically output user's BMI parameters and value on a Liquid Crystal Display (LCD) and include BMI interpretation as text for medical diagnosis to a dedicated doctor's line. The system was accurate, reliable and can be adopted as a screening tool for obesity and other related diseases.

Keywords: Body mass index, liquid crystal display (LCD), microcontroller, GSM module SIM900L, ultrasonic sensor, wheatstone.

1.0 INTRODUCTION

Body mass index (BMI) is a widely-used method to assess a person's weight status by comparing their weight in relation to their height. BMI is calculated by dividing a person's weight in kilograms by the square of their height in meters. A BMI machine is a device that measures a person's weight and height and calculates their BMI automatically. In this study explore the development of BMI machines and their impact on healthcare (National Heart, Lung, and Blood Institute, 1998; World Health Organization, 2000).

The development of BMI machines can be traced back to the early 2000s when electronic scales with built-in height measurement devices began to be used in clinics and hospitals. These machines provided an automated method for the calculation of BMI, eliminating the need for manual calculations. However, these early machines were often bulky and expensive, limiting their accessibility to healthcare providers (Abana, Llamelo, Daña, Cafugauan, & Angelo, 2020).

As technology advanced, BMI machines became more affordable and portable. In recent years, BMI machines have become widely available for use in gyms, health clinics and homes with the aid of mini computers known as microcontroller (Dipika, Varsha, Mhatre., Prashant, & Ayane, 2015). Many of these machines are equipped with additional features such as body fat percentage measurements and muscle mass analysis, providing users with a more comprehensive understanding of their weight status.

The use of BMI machines has several advantages in healthcare. They provide a quick and easy method for healthcare providers to assess a patient's weight status, allowing for the early detection of obesity and other weight-related health issues (Alao, Olajide, Musiliyu, & Owolabi, 2020). BMI machines also provide patients with a non-invasive method for monitoring their weight, which can be an important motivator for weight loss and healthy living (Akpan, Joshua, Agbogun, & Omotehinwa, 2019).

Obesity is a major health concern in most parts of the world. It is associated with several health problems such as diabetes, hypertension, heart diseases, and stroke (Flegal, Graubard, & Williamson, 2005; Chumlea, 2006; Etchison, Minton, Thompson, Collins, Hunter, & Dai, 2011). Body Mass Index (BMI) is a widely used metric for determining the health of an individual. BMI is a measure of body fat based on an individual's weight and height (Mokdad, Ford & Bowman, 2003; Baladad, Magsombol, Roxas, De Castro, & Dolot, 2016). It is calculated as the weight in kilograms divided by the square of the height in meters (kg/m^2). A

BMI of 25 or above is considered overweight, and a BMI of 30 or above is considered obese.

The accurate measurement of BMI is essential for the diagnosis and management of obesity-related diseases. The manual calculation of BMI can be time-consuming and prone to errors (Ewetumo, Adedayo, Lawal, Edun, & Orokhe, 2019; Owolabi, Akpan, & Oludola, 2021). Therefore, the development of a microcontroller-based BMI machine can help in the accurate and efficient measurement of BMI.

2.0 MATERIALS AND METHODS

This section of the study highlights the materials used in realizing the system, this can be categorised into three parts namely: electronics/electrical components, structural/mechanical framework and the computer with application software.

Table 1: Materials and their functional descriptions of the system

S/N	Description	Functions
		Electronics/Electrical Components
1	Power supply Unit	Transformer, diode, filter and voltage regulator
2	Ultrasonic Sensor	This is used for calculating the distance between obstacle (user head) and itself using the principle reflection of signal in Physics
3	GSM Module SIM900L	This is a communication module for transmitting and receiving result signal (text) between the system and medical practioner.
4	Connecting Wires	Serve as links between subsystems of input, microcontroller and the output components
5	Liquid Crystal Display (16x2)	This outputs the processed information of the microcontroller in form digital display.
6	HX711 Circuit Amplifier	This serves as signal converter that drives the load cell data in appropriate format to the microcontroller.
7	Push Button	These are switches for changing the signal state of the device.
8	Adapter and Data Transfer cable	For serial communication of signal between components of subsystems
9.	Load Cell (50kg)	Four pieces each of 50kg mass capacity connected in Wheatstone bridge format to measure user's mass.
		Structural/Mechanical Framework
10	Glass Weighing Base (TS-2003A)	This serves as structural basement that houses the load cell on which user's mass is captured.
11	Iron pole and base construction	For structural framework, support and protection of internal components
		Computer with application software
12	Proteus 8.9 electronics simulation software	This is an application platform for designing and simulating system circuitry
13	ARDUINO IDE	Arduino Integrated Development connects the Arduino hardware for programs uploading and subsystem communication.
14	SIM Card	Serves network communication carrier
15	Computer System	Dell latitude laptop, core i7, 512 SSD, 16 GIG RAM, 2.80 GHz processor speed,
16.	Arduino UNO	This is the microcontroller board that receives inputs processes it and send the output to GSM module and LCD.

Design and Analysis

The main hardware components in this system include load cell, HC-SR04 ultrasonic sensor, Arduino UNO (ATMEGA) microcontroller, 16 x 4 liquid crystal display (LCD), 4 x 4 Matrix Keypad, load cell amplifier, Connecting Wire, GSM Module. Figure 1, shows the

subsystem assemblage in block diagram format of microcontroller based body mass index machine.

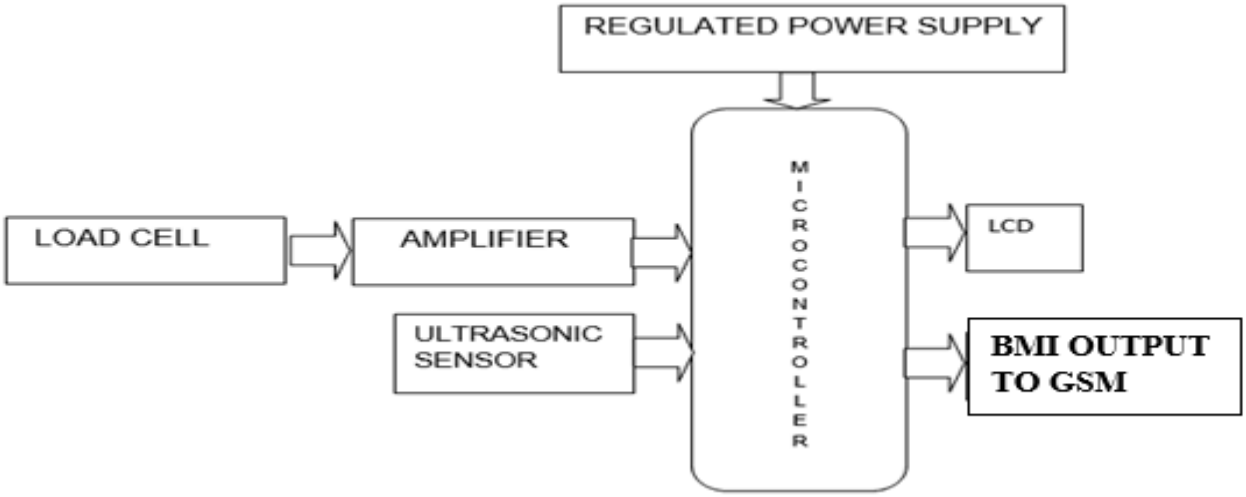

Figure 1: Block diagram of the system

The machine consists of a load cell, a height sensor, a microcontroller, an LCD display, GSM module and a power supply as shown in the system circuit diagram in Figure 2. The load cell is used for measuring the weight of the individual, and the height sensor is used for measuring the height of the individual. The microcontroller is used for processing the weight and height measurements and calculating the BMI in real-time. The LCD display is used for displaying the weight, height, and BMI of the individual.

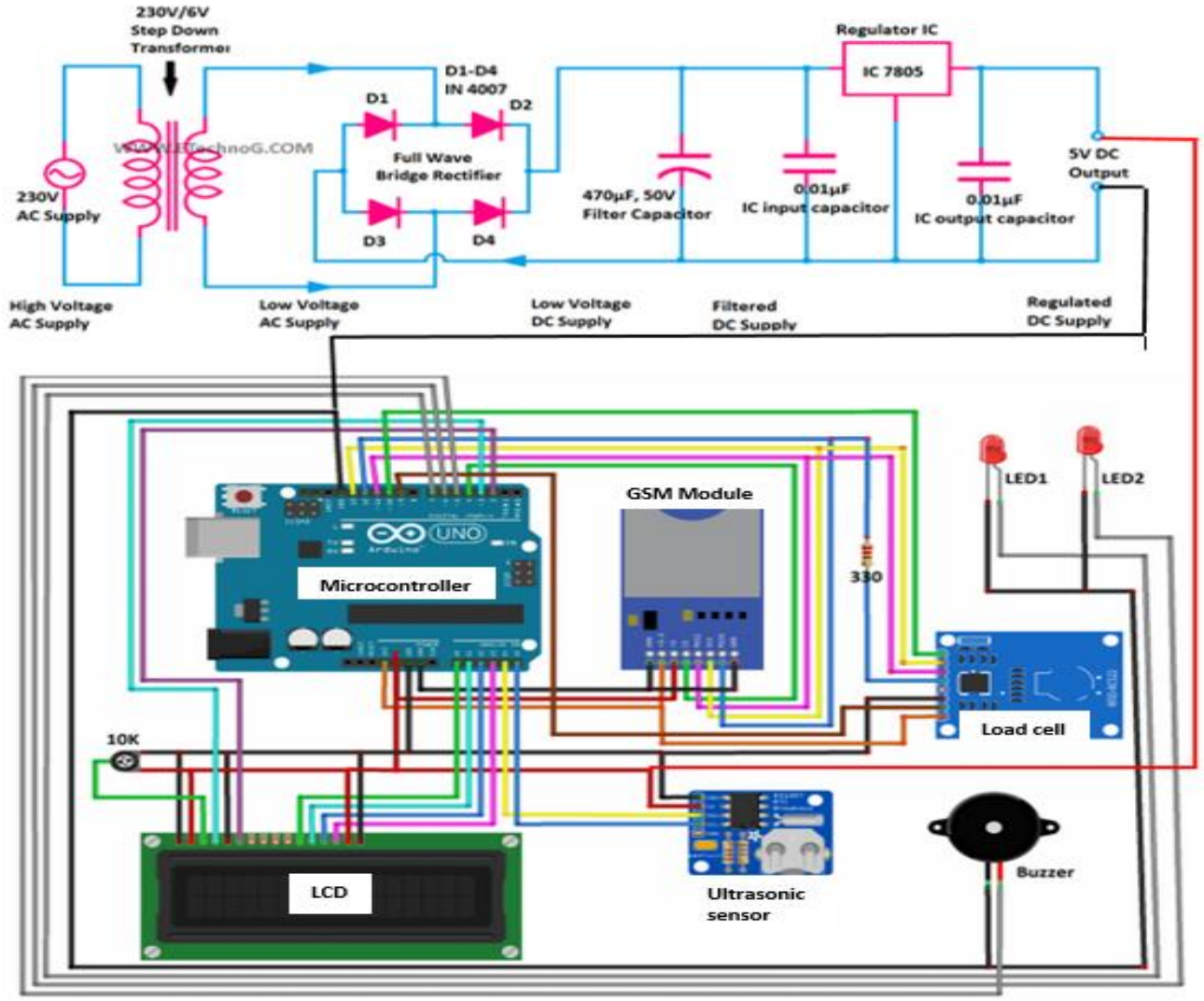

Figure 2: Complete Circuit Diagram of BMI Machine

System Power Supply

The system is driven by regulated 5V power supply unit. The power supply unit comprises of a stepdown transformer that have 220V (AC) mains as input steps it down to 9V, this is passed through a full wave bridge rectifier for conversion to direct current signal, a Pi-RC filter was designed to remove ripple and unwanted signal (noise), and finally passed through a voltage regulator (LM7805) for steady output signal.

Load Cell Circuitry for User's Mass Measurement

Four human body load cells of 50kg mass capacity each therefore effective total mass capacity of 200kg are connected in full bridge Wheatstone format, the signal from load cell is driven into the microcontroller through a HX-711 amplifier. Figure 3. shows the circuit connection of the load cells and HX-711 amplifier all placed and soldered in the glass basement.

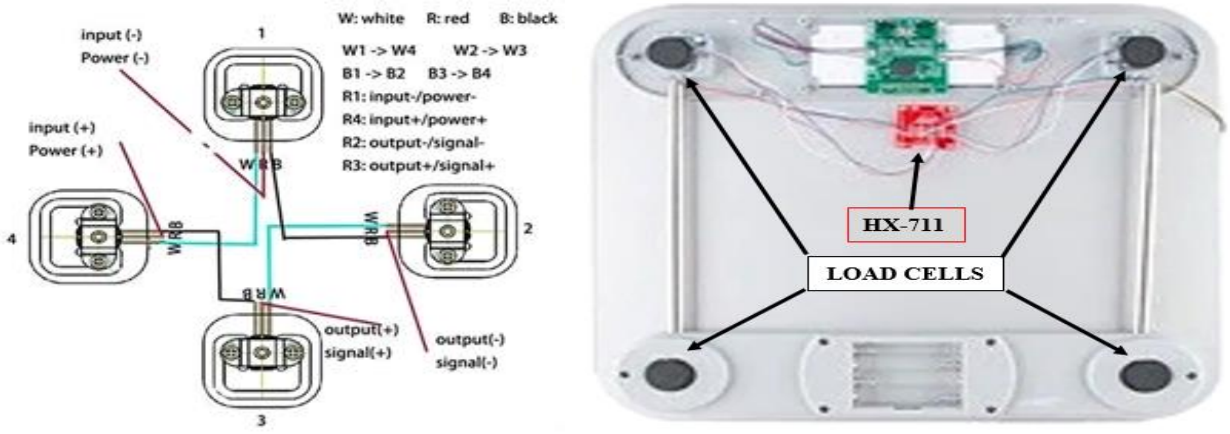

Figure 3: Load cells and HX-711 Amplifier Circuitry

Interfacing HC-SR04 Ultrasonic Sensor for Height Measurement

The sensor works based on reflection phenomenon, one of the two transducers acts as a transmitter which will emit a shot of audio burst at the barrier or surface and the same is received by the second transducer which acts as a receiver. Based on the time of transmission to when it is received by the receiver, the distance can be calculated based on the speed of sound. The sensor is attached to the system framework above the user's head for measurement of height.

Arduino Microcontroller Inputs and Output Interfacing

The microcontroller, which uses the Arduino Uno microcontroller board based on Atmega328 with fourteen (14) digital input and output pins and powered by a 5V power supply is used as the system brain box. The algorithm for the microcontroller written in C++ language was designed to receive inputs from the ultrasonic sensor, the load cell and processes it to calculate the BMI of the user based on Equation (1) as outputs to the LCD and the GSM communication module.

$$BMI = \frac{Mass(kg)}{(Height)^2(m^2)} \quad (1)$$

3.0 RESULTS AND DISCUSION

Complete System Framework

The system was designed with proteus8.9 electronics simulation software according circuit diagram, it was constructed through soldering, fitting and assemblage of components and subsystems. System is powered with 220V AC mains and a switch button is pressed to initialize the booting process of the computer. Figures 4. show the microcontroller based body mass index machine and when occupied with user.

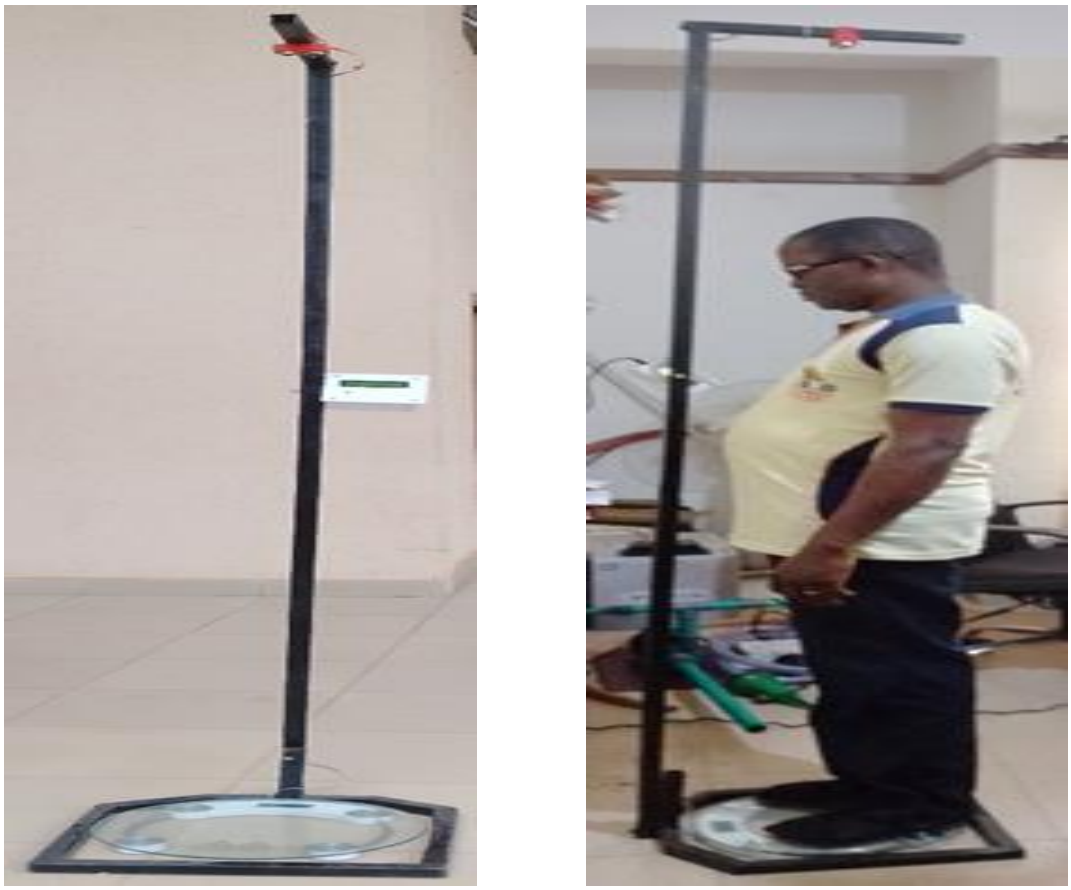

Figure 4: Microcontroller Based Body Mass Index Machine with User

Performance Test for LCD and Microcontroller

One thousand ohms of the resistor is used to limit the current going to the crystal display, and a variable resistor is used to vary the crystal display on the board. The LCD shows the BMI value as calculated by the microcontroller. Figure 5a. shows cascaded phases of the LCD when in the OFF and ON (booting and working) states.

The microcontroller does not only communicate the results on the LCD but programmed to send a backend confidential result about the interpretation of the BMI to a designated GSM contact of a medical practioner for report. Figure 5b. shows a screenshot of the result communication between the microcontroller and the GSM module.

Figure 5: (a) LCD Interface at Different States (b) Backend Confidential Communication between GSM module and Microcontroller

4.0 CONCLUSION

After the whole construction and the design analysis, the BMI Machine was able to display the weight and height, BMI (kg/m^2), BMI interpretation such as: Underweight, Overweight, Normal Weight, Obesity and often considered as a machine checker of body fatness. The result of the BMI is displayed on the LCD and also sent to the registered GSM which can be used to aid the Doctor's report.

In conclusion, the development of BMI machines has provided healthcare providers and patients with a convenient and accessible method for assessing weight status. While BMI machines have limitations, they have the potential to improve healthcare outcomes by promoting early detection and monitoring of weight-related health issues. As technology continues to advance, it is likely that BMI machines will become even more accurate and widely available, further improving their impact on healthcare.

This study can be adopted in medical centres/laboratory, institutes and homes that needs BMI measurements for an easy calculation of their patient's BMI. It can be used to measure the height or weight as an optional value of the machine.

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ADDRESSING THE DESTRUCTION OF THE ENVIRONMENT IN THE LAGOS MEGACITY THROUGH SUSTAINABLE LANDSCAPING

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ABSTRACT

With a population of 12.1 million people, Lagos is the world's 25th-largest metropolis. Lagos' population is predicted to grow to 15.8 million by 2025, putting it as the earth's 12th most populous city, thanks to an influx of around 6,000 new residents every day. In contrast to many other megacities, however, slums house more than half of the population. Pollution of the air and water, floods, mismanagement of trash, instability, and restricted access to critical facilities and city services are all outcomes of unfettered urban expansion. Lagos' economic significance has been recognized "it contributes more than 40 per cent of the national GDP". *Nevertheless, the state administration has been challenged to address these issues through the "Lagos Mega City Area Development Program."* The "Lagos State Environmental Protection Agency" is one of the government bodies tasked with correcting environmental deterioration via landscaping. This study examines how to educate and organize citizens, as well as to construct landscaped areas, and stroller, bicycle and bicycle-friendly pathways and water flow. Numerous instances are provided to show how these activities have aided in the enhancement of living situations and the reduction of greenhouse gas emissions.

Keywords: Sustainable landscape, megacity, environmental degradation

1.0 INTRODUCTION

Environmental Degradation (ED) is the "deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems; habitat destruction; the extinction of wildlife; and pollution" (Koengkan et al., 2023). According to Chertow, (2008) "I=PAT equation, environmental impact (I) or degradation is created by a combination of an existing large and growing human population (P), continuously increasing economic growth or per-capital effect (A), and the use of resource-depleting and polluting technology (T)." (Chertow, 2008) Environmental degradation is one of the ten hazards listed by the United Nations high-level panel on dangers, challenges, and change. The International Strategy of the UN for disaster reduction (2010) defines ED as "the reduction of the capacity of the environment to meet social and ecological objectives and needs". There are several forms of environmental deterioration, the ecosystem gets degraded when natural habitats are destroyed, or natural resources are exhausted. Environmental production and environmental resource management are two approaches to addressing this issue. There are several examples of environmental deterioration throughout the world. The recent fire on the Amazon is one example. It accounts for 60% of all rainforests. (Lovejoy & Nobre, 2019) It is the earth's lungs, and its destruction poses a significant threat to the ecosystem and the entire globe. The repercussions of deforestation will have a significant influence on the world's supply as well as CO_2 absorption. If deforestation continues, there will be less accessible oxygen on the planet, which might be harmful to human health. Another issue that arises as a result of this is the overconsumption and waste of paper goods derived from these trees. Because most garbage is not recycled, a massive amount of waste is generated. An additional harmful result from this is the degradation of the soil to become fewer nutrients which makes it harder to be used again. The primary cause of degradation is a human-being disturbance. (Chaudhary et

al., 2015) The nineteenth-century industrial revolution automated the production and manufacture of products introducing the use of machinery and other heavy equipment, which in turn requires fuels as a source of energy, harming the environment. Modern technological advancement, which we are proud of, is the primary source of environmental destruction. To address the issue, we must maximize resource use and management, promote sustainable development, apply a green idea, and, most importantly, include the community in all development initiatives. Because of the severity of environmental deterioration throughout the world, the World Bank and other environmental organisations have performed research to give an environmental degradation cost estimate. (Chaudhary et al., 2015) According to Maslow's hierarchy of requirements, people prioritize certain demands above others. The most basic demands are physiological: oxygen, food, water, and everything else they require to thrive, (Gitz et al., 2016) individuals' to have fundamental needs, physiological safety, and security are jeopardized as a result of environmental deterioration. (Koengkan et al., 2023) The inhabitant of a community will have less clean air, healthy food, and clean water, because of the depletion of natural resources such as air, soil, and water. (Chaudhary et al., 2015; Gitz et al., 2016; Lovejoy & Nobre, 2019) Furthermore, the dispersal of disease and the natural ecosystem disturbance does not offer a safe environment for people to live in because of the high danger of illness, outbreak, or natural catastrophes; consequently, safety and security requirements are deficiency needs. As a result, people will be hesitant to engage in any political or economic activity. This study is to evaluate how sustainable landscaping can be used to reduce the impact of environmental degradation on the environment.

"The Lagos Mega City Project" aims to alleviate Lagos State's uncontrolled urban expansion, which bears a harmful influence on the surrounding state and the nation's wealth. Granted Lagos's speedy population expansion and its 60% contribution to the national economy. (Ilesanmi, 2010; Samson Olanipekun, 2013) The "Lagos Mega City Region Development Authority" was established by the Federal Government to handle Lagos's developing status as a megacity. This region encompasses nearly the whole state of Lagos, as well as four (4) LGAs in neighbouring Ogun State. (Ilesanmi, 2010) Lagos megacity aims to tackle a variety of evolving issues, such as "power generation, fire prevention, security, geographical restructuring to leave ample parks and open gardens available as recreational facilities; potable water provision, pollution prevention, and flood control by preventing drainage blockage". While Lagos is not the only polluted metropolis in the world, it does face serious environmental issues that are compounded by the daily influx of roughly 6,000 people seeking a better living. The dumping of potentially dangerous industrial waste, inadequate solid waste management, insufficient sanitary infrastructure; soil, air, and water pollution; floods, ocean surges, insecurity, and limited access to basic infrastructure and municipal services are among the challenges.(Chaudhary et al., 2015; Nwagwu & Oni, 2015) This research discusses how landscaping projects may be used to prevent the blockage of drains with waste (a significant source of floods), as well as to discourage the dumping of garbage in public places through beautification initiatives. The utilization of direct labour in the execution of these projects also generated job possibilities, lowering poverty, which has been shown to be intrinsically linked to ecological deterioration. (Oduwaye & Lawanson, 2007; Olusegun Akiyoke, 2011)

Combating Environmental Degradation through Landscaping in Megacity

The ecological issues that plague Lagos megacity necessitate multifaceted and diversified solutions. Controlling the climate or local climate via landscaping is one of these techniques. e.g., "Air-soil temperature, humidity, air velocity and wind speed, wind direction, surface absorptive and reflectance (albedo); seasonal shading, pollution, glare, air freshness and fragrance and how this can be achieved using soft and hard landscaping". (Anthony & Stephen, 2019; Ogunsote et al., 2011) Soil temperature management, such as ventilated shade given by vines, trees, and shrubs, may be used to reduce the radiant temperature as well as lower soil relative air and surface temperature. The radiation from the sun that reaches earth and walls of the building is lowered by ventilated shades, which lowers the sun-air temperature. Lowering sun-air temperatures through ventilated shade is how air temperature is controlled and managed. Evapotranspiration, a technique through which plants acquire water from the soil and lose it through evaporation from the leaves, is enhanced by ventilated shade. This causes cooling in the same manner that sweat does in humans, (Anthony & Stephen, 2019) with the energy used to change liquid to vapour absorbed from the surrounding air. Plants in general enhance humidity in an area, which can effectively aid human comfort in dry seasons. Trees are useful in reducing airspeed and enhancing the speed of still and slow-moving air. Trees planted in rows are effectful as Windbreakers, reducing airspeed and removing dust, likewise, directing wind to and away from structures, by way of Landscaping can be achieved. (Misni, 2012); (Anthony & Stephen, 2019) Fences, walls, hedges, and trees can all be used to create an obstacle that deflects the wind over structures. On bigger plots, clusters of trees can be utilized to control wind flow in a specific direction. The landscape of an area may be utilized to influence how quickly solar energy is reflected by a surface or absorbed by the same surface. The use of grass, plants, colour, and careful pavement material selection can all help to regulate the amount of solar energy absorbed by that reflected. (Anthony & Stephen, 2019) Plant selection may be used to manage shadings at different seasons. Trees are utilized in the rain, and dry seasons to shield the chilly north wind while permitting the sun to shine in through the south. Plant material, particularly thick evergreens, and plants with dense leaves can block cold season wind. (Ogunsote et al., 2011) A smart design in the South would involve the planting of deciduous trees, which cooled the air in the hot season and shed their leaves in the cold season. Plants are very effective in reducing pollution levels because they take in harmful pollutants such as carbon dioxide, which is linked to the city's heat islands, also lowering other pollutants, particularly those emitted by cars. Tree-planted buffer zones are utilized to separate industrial and residential regions. (Anthony & Stephen, 2019; Ogunsote et al., 2011) Glaring can be avoided by growing trees to isolate this section of the skies, but consequential brightness can be avoided by growing flowers, trees, and lawns on surfaces which would normally reflect light into the structure. Plants generate oxygen and aromas, which contribute to a refreshing environment.

Landscape Elements for Climate Control

Hard and soft landscaping features might help to manage the climate. The term "soft landscaping elements" refers to plants, and "hard landscaping elements" refers to everything else, such as basic buildings, steps, paving, garden furniture, walls, and fences. (Ogunsote et al., 2011) Trees, shrubs, and other plants are the most important in terms of providing shade and controlling humidity and airflow. Air travelling over hard surfaces is either reflected, or absorbed, such surfaces as car parks lots and pavements are warm, but air moving through trees and plants are cooled, just as grasses and herbaceous border are used

to cool the ground and minimize glare, in general, vegetation increases air freshness and aroma. Surface waters are used to create humidity and air cooling, while mulch protects plant roots from over-evaporation. Straw, fallen leaves, and plastic sheeting can all be used to make mulch. Gravel, wood chips, decomposing leaves, and grass are among the other ingredients. Mulches contribute to decreasing surface and air temperature by slowing the rate at which the earth absorbs. (Anthony & Stephen, 2019; Misni, 2012; Ogunsote et al., 2011) Trellis is a lightweight structure made of intersecting strips made from plastic or wood and other materials that are used to support climbers and are frequently attached to a fence. This may be utilized to give shade on the west walls or as free-standing pieces to screen out the light from the west.

Elements of Hard Landscaping

Fences and walls: Wind is deflected by walls, which may likewise be utilized to control the wind. The wall is typically solid, whereas the fence is constructed of posts, railings, cable, wire mesh, and other materials. Even with climbers, fences allow some wind to pass through them.

Stairs and Pavement: The ground cover finish, material, and structure of stairs and pavement can all play a significant influence in lowering the ground temperature. The use of the tarmac in car park lots in the absence of any sort of canopy is a major source of heat.

Slopes and Barriers: These are used to guide airflow and may be highly successful in areas with considerable topographic differences.

Boulders and stones: Boulders and stones can be placed to control airflow and create shade.

Experiences of Landscaping in Lagos

This research outlines examples of beautifying and landscaping initiatives in Lagos, which are done to recover public areas that were formerly used as waste dumps or were taken over by illegal shack constructions, these areas are now reclaimed and converted to mini-parks and gardens. The conversion of medians around the cloverleaf junction into little parks is one of the most prominent beautifying works. In the past, squatters and hawkers occupied these public places, which were mostly utilized as open-air restrooms. Gani Fawehinmi Park and M.K.O. Abiola Garden are located near the renowned Ojota crossroads and are home to touts and mis grant individuals who have already occupied the shacks and dumps in the place. Many regions of the state have converted large road medians into gardens, albeit this ornamentation is most noticeable in Ikeja, Ikoyi, and Victoria Island. The transformation of Overhead Bridge Parking Spaces into Car Parks. Before the government's implementation of landscaping initiatives, most places beneath overhead bridges were occupied by unlawful constructions, hawkers, the mentally ill, and trash dumps. Several of these have since been turned into parking lots and properly planted. Bridges around the Marina and Ahmadu Bello Way on Victoria Island are two examples. Even Bar Beach has been planted wonderfully. Many pedestrian pathways, as well as sidewalks and bus stops, have been built around the city.

2.0 METHODOLOGY

The procedures employed in carrying out the study, which includes the research design, the target population, the sample size and the sampling procedure, research instruments and data collection techniques. The scope of this study is restricted to the offices of both the Lagos Mega City Region Development Authority and town planners in both Lagos and Ogun states. The design for this research refers to the plan, and structure of investigations to obtain detailed responses. A structured questionnaire was used to obtain information from these offices. To achieve the desired objective for this research, the type of data that was collected is both primary and secondary in nature. In selecting respondents for this study, sampling techniques were used. A

questionnaire with closed-ended multiple-choice questions which were mailed and hand-to-hand distributed to the respondents. The respondents constituted the management personnel in the selected offices and other people living in the study area. A letter of introduction and an explanation about the purpose of the study was attached to the questionnaire. The use of Statistical Package for the Social Sciences (SPSS), is done by converting the numeral score of the respondents into percentages of the research and also getting the means and rank of the responses with the use of the Relative Importance Index (RII) formula (Fagbenle et al. 2004) which is as follows:

$$RII = \frac{PiUi}{N(n)}$$

Where,
RII = relative importance index
Pi = respondent's rating
Ui = number of respondents placing identical weighting/rating
N = sample size
n = the highest attainable score
The findings are as follows below:

3.0 RESULTS AND DISCUSSION

This study aimed to evaluate the means of using sustainable landscaping in combating environmental degradation caused by solid waste disposal in the emerging Lagos megacity. According to the findings, it was shown that the hazards or threats caused by improper solid waste disposal on people and their environment by soil contamination are ranked first, followed by air contamination which is ranked second, followed by water contamination which is ranked third, followed by bad impact on human health, and by a disease-carrying pest which is ranked fourth, followed by adversely affect the local economy which is ranked fifth, and finally by the impact on animals and marine life which is ranked sixth, which is also the least of the hazards or threats caused by improper solid waste disposal on people and their environment as a whole. Furthermore, the data analysis reveals how sustainable landscapes (green areas) can be used to combat threats imposed by solid waste disposal on the environment and its dwellers' soft landscaping elements are ranked first, hard landscaping elements are ranked second, followed by outdoor living spaces which are ranked third, and finally by plant selection in landscaping which is ranked fourth making it the least of how sustainable landscape (green areas) can be used to combat threats imposed by solid waste disposal on the environment and its dwellers. Also shown from the analysis are the benefits of a sustainable landscape to society in combating environmental degradation by solid waste disposal. it shows that improvement of indoor and outdoor air quality is the number one benefit among others and an integrated and systemic approach to design is ranked 6th, making it the least of the benefits of sustainable landscape to the society in combating environmental degradation by solid waste disposal. Finally, to summarize the findings, the analysis reveals how a sustainable landscape can be achieved in society to combat the threats posed to people and their environment by solid waste disposal through the use of recycled resources such as glass, rubber from tires, and other elements to make landscape items was greatly preferred., followed by the construction of sidewalks and bus-stops.

4.0 CONCLUSION

From the study of evaluation of means of using sustainable landscaping in combating environmental degradation by solid waste disposal in an emerging megacity, and judging from the various computations, analysis and findings, the result revealed some relevant factors from which the researcher drew a certain conclusion. This research shows that the hazards caused by improper solid waste disposal on people and their environment as a whole which are soil contamination, air contamination, water

contamination, bad impact on animals and marine life, disease-carrying pests and adversely affecting the local economy. This study also shows how sustainable landscape can be used to combat threats imposed by solid waste disposal on the environment and its dwellers through soft landscaping elements, hard landscaping elements, outdoor living spaces and plant selection in landscaping. It also revealed the benefits of sustainable landscape to society in combating environmental degradation by solid waste disposal which is the improved indoor and outdoor air quality, increased energy efficiency, waste reduction, protection of ecosystem and resource conservation, integrated and systemic approach to design, economic performance and protection of public health and improvement of enhanced productivity. A sustainable landscape can be achieved in society to combat the threat imposed on the people and their environment by solid waste disposal which is through the conversion of road medians to mini-parks, conversion of areas beneath overhead bridges to parking lots, the building of walkways and bus stops, and reprocessing of items such as crystal, latex from tires, and other resources to make landscaping products. Therefore, the study concluded that to combat environmental degradation by solid waste disposal, there is a need for a sustainable landscape which can be achieved by the conversion of road medians to mini-parks, conversion of areas beneath overhead bridges to parking lots, the building of walkways and bus stops, and glass, rubber from tires, and other materials are recycled to generate landscape goods such as paving stones, mulch, and other materials.

Towards effective usage of sustainable landscaping in combating environmental degradation by solid waste disposal in emerging Lagos megacity, it is recommended that landscape design should be one of the documents required for building document approval by the planning authorities. Soft landscaping elements should be greatly encouraged within the city since it combats threats imposed by solid waste disposal on the environment and its dwellers. Furthermore, recycling old items (solid waste) like glass, tire rubber, and other materials to produce landscape components such as paving stones, mulch, and other materials is one of the greatest methods to establish a sustainable landscape and address the risks posed by solid waste disposal.

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