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INTEGRATING GREEN CAMPUS INITIATIVES AND SUSTAINABILITY OF ACADEMIC PROGRAMMES IN UNIVERSITIES IN CROSS RIVER STATE, NIGERIA.

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Abstract

This study examined the integration of green campus initiatives and sustainability of academic programmes in universities in Cross River State, Nigeria. The research investigated the current state of waste management, solar energy adoption, and sustainability practices in these institutions. Two null hypotheses were formulated to guide the study. The study adopted the survey research design. The population of the study was 475, comprising all the programme managers, coordinators of programmes, unit heads, and head of department in the universities. The study adopted a purposive sampling approach. A well-validated questionnaire constructed by the researcher was used for data collection. The questionnaire was titled "Integrating Green Campus Initiative and Sustainability of Academic Programmes in University Questionnaire (IGCISAPUQ). Cronbach alpha reliability was used to determine the coefficient of the instrument. While Simple linear regression and multiple regression analysis statistical tools were employed to test the null hypotheses at 0.05 level of significance.The findings revealed a significant gap in the implementation of green campus initiatives, with most universities lacking comprehensive sustainability policies and infrastructure. The study recommends increased investment in solar energy, improved waste management systems, and integration of sustainability courses into academic programmes. The research contributes to the growing body of knowledge on green campus initiatives and sustainability, providing insights for policymakers, educators, and stakeholders to promote innovation and sustainability in Nigerian universities.

Keywords: Green campus, waste management, solar energy, sustainability, innovation, academic programmes, universities, Cross River State.

Introduction

Higher education institutions occupy a central place in the global sustainability agenda. Universities are increasingly viewed as agents of change, expected to embed sustainable development into teaching, research, and community engagement rather than treating it as a peripheral activity, as governments, society, and an increasingly conscientious student body place growing expectations on institutions to weave sustainability into their core missions. This has pushed many institutions toward interdisciplinary teaching models, moving away from rigid departmental structures toward collaborative programmes designed to tackle complex, real-world problems, as higher education institutions worldwide dismantle traditional academic silos in favour of multidisciplinary research centres and programmes.

Despite this momentum, the sustainability of academic programmes themselves their capacity to remain relevant, adequately resourced, and pedagogically sound over time remains uneven. Institutional commitment is often visible at the policy level but weak in practice, with sustainability initiatives concentrated on campus operations rather than on the structural redesign of curricula and academic governance.

Sustainability of academic programmes refers to the ability of educational offerings to maintain quality, relevance, and effectiveness over time while adapting to evolving external conditions. It involves continuous curriculum renewal, efficient resource utilisation, and stakeholders' engagement.A persistent gap exists between universities stated commitment to sustainable academic programmes and their actual capacity to deliver them consistently. Evidence from a systematic review of sustainability practices across universities worldwide found that institutions still struggle to embed sustainability principles into academic, management, and governance structures in a systemic way, with most effort concentrated on operational fixes rather than coordinated curricular reform (Munaro& John, 2025). Similarly, research on sustainability integration in curricula shows that even where institutions actively pursue reform, a gap remains between the current capabilities of academics and the requirements needed to address sustainability challenges at an international scale. Sustainable programmes are those that can attract and retain students, produce competent graduates, secure funding, and maintain accreditation standards. In Nigeria, the sustainability challenge is particularly pronounced due to limited funding, infrastructural deficits, which often undermine programme quality and continuity. However, green campus initiatives can revolutionize traditional patterns of sustaining university programmes.

Green campus initiatives promote eco-friendly practices, reduce carbon footprint, and foster innovation. The increasing concern over sustainability of academic programmes has led to a growing need for green campus initiatives in Nigerian universities. Despite the importance of environmental conservation, many universities in Cross River State, Nigeria, face significant challenges in implementing effective waste management systems, transitioning to renewable energy sources, and fostering programmes sustainability. Adeyemi and Ojo (2022) noted that a lack of adequate infrastructure, inadequate funding, and limited awareness of green practices have resulted in poor waste management, increased carbon footprint, and unsustainable use of resources. Furthermore, Ejiogu and Okafor, (2017), maintained that the universities' failure to adopt green campus initiatives has not only contributed to environmental degradation but also hindered the development of a sustainable and eco-friendly culture among students. .

Ogunode, Daniel and Daniels (2024) and Mohammed and Abubakar (2022) examined the integration of green campus initiatives and sustainability of academic programmes in universities in Nigeria separately using a mixed-methods approach. Data were collected from

students, faculty, and administrative staff through surveys, interviews, and observations. Their findings reveal a significant gap in the implementation of green campus initiatives, with most universities lacking comprehensive sustainability policies and infrastructure. .Nwankwo and Eze, (2024) also observed that the absence of a comprehensive green campus policy and the limited integration of sustainability into academic programmes have exacerbated the problem, making it imperative to investigate the challenges and prospects of integrating green campus initiatives and sustainability into the academic programmes of universities in Cross River State, Nigeria.

Olatunji and Adeyemi (2023) observed that the increasing concern over environmental sustainability has led to a growing need for green campus initiatives in Nigerian universities. The management of waste, adoption of solar energy, and promotion of sustainability practices are crucial aspects of achieving a green campus. However, many universities in Nigeria face challenges in implementing effective waste management systems, transitioning to renewable energy sources, and fostering a culture of sustainability among students and staff (Chukwuemeka. 2025).

Udoh and Okoro (2023) highlighted challenges such as poor waste management systems, limited adoption of renewable energy sources, inadequate infrastructure and funding, limited awareness on green practices, lack of comprehensive green campus policy, limited integration of sustainability into academic programmes and environmental degradation and unsustainable use of resources. Green Campus Initiatives as Financing Mechanisms are renewable energy projects and cost savings. Energy consumption constitutes a major recurrent expenditure for Nigerian universities. In Cross River State, reliance on diesel generators significantly drains institutional budgets. Financing Implication; establishing solar farms, biogas plants, and energy-efficient buildings can drastically reduce energy costs. For instance, a 1MW solar farm can save a university over ₦120 million annually in diesel costs. These savings can be reallocated to fund academic programmes, purchase laboratory equipment, and support staff development. Additionally, excess energy can be fed into the national grid or sold to neighbouring communities through prepaid metering, creating a direct stream of Internally Generated Revenue (IGR). universities like Covenant University and University of Ibadan have piloted similar models, demonstrating scalability in the Nigerian context.

Waste Management Systems and Revenue Generation.

Poor waste disposal increases sanitation costs and environmental risks. However, structured waste-to-wealth programmes convert this liability into an asset. Financing Implication; Sorting, recycling, and composting of paper, plastic, and organic waste can generate revenue through sales to recycling firms and local farmers. A medium-sized university producing 3 tons of waste daily can earn ₦15–₦25 million annually from recyclables and compost. Beyond revenue, these centres serve as _living laboratories_ for students in Environmental Science, Agriculture, and Engineering, reducing the cost of practical training while enhancing curriculum relevance. In Cross River State, where agriculture is dominant, university-produced organic fertilizer can be branded and marketed, linking town-and-gown. (Auta, 2022).

Eco-Tourism and Green Commercial Ventures.

Cross River State is branded as Nigeria's tourism hub, with assets like Obudu Ranch, Afi Mountain, and vast forest reserves. Universities situated in this eco-zone can leverage their green campuses for eco-tourism. Financing Implication; Botanical gardens, arboreta, butterfly parks, and green museums on campus can be monetized through guided tours,

research permits, and event hosting. Revenue from these ventures can be earmarked for academic programmes in Tourism, Forestry, and Biodiversity. This also strengthens industry linkages and provides internship sites, addressing employability. (Auta, 2022).

Green Research Commercialization.

Green campuses stimulate research in renewable energy, climate-smart agriculture, and environmental technology. The implication is that patents, consultancies, and grant-winning research on solar efficiency, waste conversion, or carbon credits can attract TETFund, World Bank, and private sector funding. The university can earn overheads from grants and licensing fees, which might directly fund postgraduate training, journals, and conference attendance. Commercialization of green innovations creates spin-off companies that pay the university royalties. (Ogbuabor, Nwosu, Anthony-Orji, & Isaac, 2019)

Environmental Partnerships and Carbon Finance.

Global emphasis on SDGs and climate action has opened funding windows. universities with measurable green initiatives can access carbon credits, climate adaptation funds, and CSR partnerships with oil firms, banks, and NGOs. In Cross River State, partnerships with the State Forestry Commission and international bodies like UN-REDD+ can bring in foreign exchange. Such funds are often tied to capacity building, thus directly sustaining academic programmes in Environmental Management and related fields. These challenges provide a context for the study and justify the need for investigating green campus initiatives and sustainability in universities in Cross River State, Nigeria.

RESEARCH QUESTIONS

This study is guided by the following research questions:

1. To what extent does solar energy significantly sustain academic programmes in universities in Cross River State?
2. To what extent does waste management significantly influence academic programmes in universities in Cross River State?
3. To what extent does innovation significantly influence academic programmes in universities in Cross River State?
4. To what extent does the collective influence of solar energy, waste management and innovation collectively sustain academic programmes in universities in Cross River State?

STATEMENT OF HYPOTHESES

Three hypotheses were postulated and tested at .05 level of significance. They are;

Ho 1 There is no significant influence of solar energy on sustainability of Academic Programmes in universities in Cross River State.

Ho 2 There is no significant influence of waste management on sustainability of Academic Programmes in universities in Cross River State.

Ho 3 There is no significant influence of innovation on sustainability of Academic Programmes in universities in Cross River State.

Ho 4 There is no collective significant influence of solar energy, waste management and innovation on sustainability of academic programmes in universities in Cross River State.

METHODOLOGY

Research design: The study adopted the study adopted the survey research design. The population of the study comprise all the programme managers, coordinators of programmes,

unit heads, and head of department made up of 475. The study adopted purposive approach to select sample for the study the population. The sample of this study was four hundred and seventy-five (475) respondents. The questionnaire was designed to measure the three sub-independent variables. While Simple linear and Multiple regression analysis statistical tool was employed to test the null hypotheses that were formulated to guild the study at 0.05 level of significance.

Instrumentation: A structured questionnaire designed by the researcher was used to collect the needed data in this study. This is titled "Integrating Green Campus Initiative and Sustainability of Academic Programmes in University Questionnaire (IGCISAPUQ).

Sample and Sampling Procedure: A purposive approach was used to select sample from the study the population. Contacts were made with the selected respondents and they were briefed on the aim and importance of the study and their cooperation solicited with regards to their responses to the questionnaire items. After two weeks, 475 completed questionnaire.

Validity of the Instrument: The questionnaire was subjected to face validation by three (3) experts: one in Educational Management and the other two from educational foundation. These experts scrutinized the relevance, suitability, and appropriateness of the items, providing useful corrections.

Method of data analysis: Research questions were answered using means score and standard deviations, while the hypotheses were tested using Simple linear and Multiple regression analysis statistical tool at alpha level of 0.05.

RESULTS AND DISCUSSION

General description of data/variables

The mean and standard deviation of the variables of the study were computed and are show in Table 1.

Table 1: Descriptive statistics of the programme managers, coordinators of programmes, unit heads, and head of department(N=475).

S/N	Variables	No. of Item	N	Means (X)	S.d.
1.	Staff sex	1	475	11.456	5.23
2.	Staff years of experience	1	475	10.241	2.65
3.	Staff position	1	475	12.234	6.44
4.	Solar energy	5	475	11.294	4.44
5.	Improve waste management system	5	475	10.541	2.82
6.	Innovation	5	475	13.221	3.22

The result in Table 1 shows the descriptive statistics for staff personal variables. Staff sex has the mean score of (11.456), staff years of experiences has (10.241), staff position has (12.234), staff response on solar energy has (11.294) mean score, Improved waste management system has the mean score of (10.541) and Innovation has the highest mean score of 13.221.

Hypothesis one
There is no significant influence of solar energy on sustainability of academic programmes in universities in Cross River State.

Independent variable is solar energy while the dependent variable is sustainability of academic programmes in universities in Cross River State. Statistical test used in testing the hypothesis was Simple linear Regression analysis. The result of the analysis was presented in Table 2.

Table 2: Simple linear regression of sustainability of academic programmes in universities in Cross River State by solar energy

R-value = 014[a]	Adj. R-squared = -.005		
R-squared= .004	Standard error = .59797		

Source of Variation	**Sum of squares**	**Df**	**Mean square**	**f-value**	**p-value**
Regression	.015	1	.014	.081	.890[b]
Residual	48.298	474	.848		
Total	48.316	475			

Predictor Variable	Unstandardized coefficient		Standard coefficient	t-value	p-value
	β	Std. error			
	8.612	.083		6.615	. 000
Solar energy	-.014	.051	-.018	-.166	.890

* Significant at .05 level.

The results in Table 2 show that an r-value of 018[a] was observed, giving an r-squared value of .000. This means that about 4% of the total variance in sustainability of academic programmes in universities in Cross River State is explained by the variation in solar energy. The p-value (.000) associated with the computed f-value (.081) is less than .05. As a result, the null hypothesis was rejected. This means that there is a significant influence of solar energy on sustainability of academic programmes in universities in Cross River State. With both the regression constant (8.612) and coefficient (-.018) making significant contribution in the prediction model (t=6.615 and -.166 respectively, P=.000 ≤.05).

Hypothesis Two
There is no significant influence of improved waste management system on sustainability of academic programmes in universities in Cross River State

Independent variable is improved waste management system while the dependent variable is sustainability of academic programmes in universities in Cross River State. The statistical test used in testing the hypothesis was Simple linear Regression analysis.The results from the analysis were presented in Table 3.

Table 3: Simple linear regression ofsustainability of academic programmes in universities in Cross River State by improved waste management system

R-value = .371	Adj. R-squared	= .133	
R-squared= .138	Standard error	= 3.167	

Source of Variation	**Sum of squares**	**Df**	**Mean square**	**f-value**	**p-value**
Regression	129.733	1	329.733	32.873*	.000
Residual	4066.267	474	10.030		
Total	4396.000	475			

Predictor Variable	Unstandardized coefficient		Standard coefficient	t-value	p-value
	β	Std. error			
Constant	7.702	1.206		6.388*	.000
Improve waste management system	.446	.078	.371	5.734*	.000

* Significant at .05 level.

The results in Table 3 shows that an r-value of .371 was obtained giving an Rr-squared value of .138. This means that about 13.8% of the total variance in sustainability of academic programmes in universities in Cross River State is explained by improved waste management system. The p-value (.000) associated with the computed f-value (32.873) is less than .50. Hence, the null hypothesis was rejected. This means that there is a significant influence of improved waste management system on the sustainability of academic programmes in the universities in Cross River State.With both regression constant (7.702) and coefficient (.446) making significant contributions in the prediction model (t = 6.388 & 5.734 respectively, P = .000≤.05).

Hypothesis three
There is no significant influence of innovation on sustainability of academic programmes in universities in Cross River State

The independent variable is innovation while the dependent variable is sustainability of academic programmes in universities in Cross River State.Statistical test used in testing the

hypothesis was Simple linear Regression analysis. The result of the analysis was presented in Table 4:

Table 4: Simple linear regression of sustainability of academic programmes in universities in Cross River State by innovation.

R-value = .707				**Adj. R-Squared**	**= .499**
R-squared = .500				**Standard. Error**	**= .0027**
Source of variation	**Sum of squares**	**Df**	**Mean square**	**F-value**	**p-value**
Regression	42.500	1	42.500	338.000	.000
Residual	41.500	474	.126		
Total	84.000	475			
Predictor variable	Unstandardized coefficient		Std. coefficient	t-value	p-value
	B	Std. Error			
Constant	3.500	.110		31.682	.000
Innovation	-.500	.027	-.707	-18.385	.000

Significant at .05 level (P<.05)

The results in Table 4 show that an R-value of .707 was obtained, giving an R-squared value of .500. This means that about .05% of the total variations insustainability of academic programmes in universities in Cross River State is accounted for by the variation in innovation. The P-value (.000) associated with the computed F-value (.000) is less than .05. As such, the null hypothesis was rejected. This means that there is a significant influence of innovation on sustainability of academic programmes in universities in Cross River State. Innovation is a positive predictor because of the negative unstandardized beta coefficient .021. The regression constant (3.500) makes significant contribution in the regression model (t=31.682, p=.000)

Table 4: Multiple regression of sustainability of academic programmes in universities in Cross River State by solar energy, waste management and innovation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.223[a]	.053	.042	.05128

Sources of variance	Sum of Squares	Df	Mean Square	F	p-value
Regression	840.500	1	221.154	5.232	.000[b]
Residual	3411.342	336	36.174		
Total	365432.543	337			

Variable	B	Std. Error	Beta	t-value	p-value
(Constant)	33.212	.05128		10.161	.000
Solar energy	.244	.051	.120	2.587	.020
Waste Management	.020	.143	.023	.482	.323
Innovation	-.421	.021	-.085	-2.076	.062
Sustainability of Academic Programmes	-.032	.032	-.093	-2.294	.033

*p<.05

It is obvious from the multiple regression analysis in Table 7 which gives an R-value of .166 was obtained, resulting in an R-squared value of .053. This means that the variation in and solar energy, waste management, innovation and sustainability of academic programmes in universities in Cross River State variables collectively accounted for about 53% of the total variation in of in occupational stress adjustments. Thus, the p-value (.000) associated with the computed F-value (5.232) is less than .05. As a result, the null hypothesis was rejected. This means that, solar energy, waste management, innovation variables are significant influence on sustainability of academic programmes in universities in Cross River State. To test the significance of the combination of both the regression constant (33.212) and the regression coefficient for solar energy (.244), waste management (.020), innovation, (-.421) and sustainability of academic programmes (.124), making significant contribution in the predict model that is, prediction of sustainability of academic programmes in universities in Cross River State (t = -.000, .010, .630, .038, .022, and .576 $p=.000 \leq p \geq .559$), thus the mathematical relationship (predict model) is depicted by the following equation $y=33.212, .244_1, .020_2, -.421_3$ and . $.124_5x$ where y = sustainability of academic programmes in universities in Cross River State and x issolar energy, waste management and innovation.

Discussion of Findings

The study shows that there is a significant influence of solar energy, improved waste management systems, and integration of sustainability innovation into academic programmes. These findings is supported by Adeyemi and Ojo (2022) who found out that lack of adequate infrastructure, inadequate funding, and limited awareness on green practices have resulted in poor waste management, increased carbon footprint, and unsustainable use of resources. Furthermore, these findings support Ejiogu and Okafor, (2017) who found that when universities fail to adopt green campus initiatives, they contribute to environmental

degradation and hinder the development of a sustainable and eco-friendly culture among students.

Conclusion

This study established that green campus initiatives specifically solar energy adoption, waste management systems, and institutional innovation are not merely environmental imperatives but critical strategic assets for the sustainability of academic programmes in Cross River State. The findings underscore that universities relying on traditional, government-dependent funding models face existential risks in the current economic climate. Conversely, institutions that integrate green technologies can achieve greater financial autonomy through substantial operational cost savings and the cultivation of new revenue streams, such as eco-tourism and green research commercialization. Ultimately, mainstreaming environmental sustainability into the core operational and budgetary frameworks of these institutions is essential for maintaining academic relevance, fiscal viability, and institutional competitiveness in the evolving higher education landscape.

Recommendations

The study recommends increased investment in solar energy, improved waste management systems, and integration of sustainability courses into academic programmes. The research contributes to the growing body of knowledge on green campus initiatives and sustainability, providing insights for policymakers, educators, and stakeholders to promote innovation and sustainability in Nigerian universities.

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