

# Implementation Of Smart Climate Change Policies For Effective Management Of Joseph Sarwuan Tarka University, Makurdi - Nigeria

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## **Abstract**

*Climate change has become a significant worldwide environmental challenge with extensive implications, compelling both governments and non-governmental organizations to remain vigilant, as it seemingly impacts various sectors of the global economy including education. This study investigated the implementation of smart climate change policies for effective management of Joseph Sarwuan Tarka University, Makurdi - Nigeria. Theorized by the diffusion of innovations theory, the study was guided by two research questions and two null hypotheses were formulated and tested. The study used a descriptive survey design. The population comprised 85 staff (12 principal staff and 73 Senior Administrative staff) from Joseph Sarwuan Tarka University, Makurdi. The Census sampling technique was used to take all the 85 respondents for the study. This is because the population is relatively small and manageable, making it feasible to collect data from each member. Implementation of Smart Climate Change Policies Questionnaire (ISCCPQ) was used for data collection. To answer the research questions, the data were analysed using Mean and Standard Deviations, while Chi-Square test of goodness-of-fit was used to test the hypotheses at 0.05 level of significance. The findings highlight the positive impact of green building practices on the effective management of Joseph Sarwuan Tarka University, Makurdi. In addition, the research demonstrates a favorable impact on the adoption of renewable energy solutions and effective management of university. The study concluded that the utilization of renewable energy not only aligns with eco-friendly practices but also contributes to the overall operational efficiency and sustainability of the university. The study recommended that educational authorities and policymakers prioritize integrating green building practices and renewable energy solutions, pointing towards the prospect of improved governance and functionality for university education facilities not only in Joseph Sarwuan Tarka University, Makurdi, but throughout Nigeria and other countries of the world.*

**Keywords:** *Climate Change, Smart Policies, Effective Management, Green Building, Renewable Energy.*

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## **I. Introduction**

Climate change has emerged as one of the major global environmental crises with far-reaching consequences, keeping governments and non-governmental organizations on their toes as it appears to be affecting all sectors of the global economy. This is evidenced by the recent spate of conferences, advocacy campaigns, reports and extensive research efforts. Agenda 21 of the Rio Declaration in 1992, the pivotal contributions of the Intergovernmental Panel on Climate Change (IPCC) in 2001, and the historic Copenhagen Conference in 2009 (Pinga & Jor, 2019). Climate change signs are visible all over the world, including Africa, which Nigeria is a part of. These include rising temperatures, rising sea levels, more frequent and severe weather events, and changing precipitation patterns, which have disrupted communities and economies (UNEP, 2020).

The term climate refers to the long-term average of weather patterns in a particular region or on the entire planet. It encompasses factors like temperature, humidity, precipitation, wind patterns and other meteorological elements that typically characterize a specific geographic area over an extended period of time (Pinga, 2018). While, climate change is seen as the consistent alteration of weather patterns within a specific region over an extended duration. This phenomenon explains the unprecedented shifts in weather conditions occurring over a long period of time (Tamuno, 2007). In accordance with Obasi (2010), climate change signifies a significant departure from the typical range of atmospheric conditions necessary to sustain human life and biodiversity. Tamuno (2007), Tamuno (2004) and Ayoade (2003) collectively define climate change as persistent variations in atmospheric conditions over extended periods, which indicate a long-term transformation in the climate

characteristics of a location, with no return to previous conditions. It also denotes alterations in the long-term average weather patterns experienced by a given region.

The manifestations of these climate change related signs are distinctly evident across various dimensions, encompassing temperature fluctuations, the desiccation of soils and water bodies, heightened occurrences of pests and diseases, alterations in the suitability zones for agriculture and livestock, a surge in desertification within the Sahara region, and shifts in rainfall patterns leading to erosions and flooding, thereby affecting arable lands, residences, and educational institutions (Pinga, 2018; Yawe, Pinga, & Ivase, 2019). This multifaceted array of impacts unequivocally attests to the urgency of addressing climate change and implementing mitigation strategies on a global scale. The effects of climate change are increasingly evident in diverse areas of Nigeria, with Benue state experiencing shifting rainfall patterns leading to unprecedented floods, heightened soil erosion, more frequent storms, desert encroachment, and rising temperatures. These outcomes underscore the substantial environmental, social, and economic challenges posed by climate change in Africa, as underscored by the 2007 assessment report of the fourth Intergovernmental Panel on Climate Change (IPCC). The report identified Africa, including Nigeria, as one of the region's most susceptible to the impacts of climate change.

Turning the focus to the African continent, climate change impacts on education and other sectors are pronounced and often disproportionately affect the most vulnerable populations (AfDB, 2019). In Africa, where many nations already grapple with limited resources and development challenges, climate change exacerbates these problems (Pinga, Ivase & Nomayu, 2017). Pinga, Ivase and Nomayu, note that the continent faces a heightened risk of extreme weather events, prolonged droughts and food security issues, all of which have direct and indirect effects on education. Infrastructure damage from floods and storms, disrupted school attendance due to extreme heat, and decreased agricultural productivity, leading to economic stress on families, all play a role in hindering educational progress. In many countries, the impact on education is evident through disruptions in school calendars, damaged infrastructure, and threats to the well-being of students and teachers (UNESCO, 2019). These climate-induced challenges pose substantial barriers to quality education, particularly for vulnerable and marginalized populations (World Bank, 2016). In Nigeria, the largest country in Africa, the impacts of climate change reverberate across sectors, further underscoring the urgency of climate-resilient education systems (Nigeria's INDC, 2015). Addressing these challenges requires a multifaceted approach that integrates climate resilience into educational policies, encourages sustainable practices, and fosters awareness of climate-related issues among students and communities (World Bank, 2016). As such, the global educational landscape is increasingly recognizing the urgency of addressing climate change and integrating sustainability into curricula and school management practices to mitigate its impact and prepare future generations for the environmental challenges they will face.

Today, smart climate change policies are currently being advocated, and if implemented, they can help control the human activities that are causing climate change. Smart climate change policy is seen as measures aimed primarily at changing community members' mindsets to engage in world-class practices that will help our environment return to normalcy (John, 2020; Okwori, Pinga & Ahua, 2018). Smart climate change policies involve strategic, science-based initiatives and measures aimed at mitigating and adapting to the impacts of climate change (Jones, 2019). These policies/measures leverage innovation, sustainable practices and international collaboration to achieve effective, long-term solutions for the planet's environmental challenges. They prioritize efficiency, resilience, and the integration of cutting-edge technologies to address climate-related issues while promoting economic and social sustainability (Brown & Smith, 2020). As key players in the knowledge industry, universities can play an important role in institutionalizing green building practices and renewable energy solutions, among other measures to significantly contribute to the restoration of normalcy in our environment.

This line of reasoning is inspired by Everett Rogers' Diffusion of Innovations Theory, which examines how new ideas, practices or technologies spread within a social system. It considers factors like innovation characteristics, communication channels, social systems, time and adopter traits, categorizing individuals from early adopters to laggards. Effective communication and perceived benefits of innovations are key in influencing adoption. When applied to the implementation of smart climate change policies in universities, the theory can help identify different adopter categories among teachers, students and administrators. By tailoring communication and emphasizing the benefits of green building practices and the use of renewable energy technologies that schools can adopt to overcome barriers and promote their widespread integration, contributing to more effective climate-conscious environment.

Green building practices, recognized as a prominent climate-friendly strategy, have garnered significant interest for their environmentally conscious approach to construction and maintenance. Green building practices refer to the use of sustainable and environmentally friendly techniques, materials and designs in the construction, operation and maintenance of buildings and environments (Abu, 2019). The primary goal of green building is to provide guidelines and standards for green building practices, thereby ensuring that local materials are collected and recycled, rainwater is harvested and preserved for irrigation and other purposes, buildings are design to meet established criteria for sustainability and plants, as well as waterways are designed to control erosion. Green

building practices are not only environmentally responsible but also often result in long-term cost savings and improved occupant well-being (Abu, 2019). Green building practices encompass a range of sustainable design principles and technologies aimed at minimizing environmental impact. According to Brown and Smith (2020), the incorporation of green building elements in institutions of higher learning has a multifaceted impact on management efficiency. Furthermore, improved indoor environmental quality as a result of green building practice has a positive impact on the well-being and performance of students and staff, contributing to a healthier and more conducive learning environment. Institutions embracing green space building prioritize well-planned and strategically positioned structures to provide students and staff with natural ventilation and various health-related advantages.

Furthermore, the implementation of green building practices in institutions of higher learning aligns with broader educational goals, fostering a sense of environmental stewardship among students. As noted by Williams (2020), sustainable features integrated into the university's infrastructure serve as educational tools, providing opportunities to teach learners about environmental responsibility and resource conservation. This holistic approach to education not only enhances the university management practices but also instills a culture of sustainability that extends beyond the school premises. By promoting eco-friendly practices and a deeper understanding of environmental issues, green building practices contribute to the development of socially and environmentally conscious citizens, thus influencing the long-term sustainability of schools and communities (Williams, 2020).

In addition, the adoption of renewable energy solutions in the educational sector has been recognized as a significant factor with the potential to impact the management of universities positively (John, 2020). Implementing renewable energy sources, such as solar power, like the one planted at Joseph Sarwuan Tarka University, Makurdi can contribute to cost savings and increased energy efficiency. This, in turn, enhances the financial sustainability of such universities/ institution, allowing for redirected resources towards educational programmes and facility improvements, thus positively influencing overall university management. Furthermore, the adoption of renewable energy solutions aligns with broader environmental sustainability goals, reducing the carbon footprint of the institution and contributing to a greener and healthier learning environment. In addition to cost savings, the integration of renewable energy has enhanced the resilience of schools to power disruptions, thereby ensuring uninterrupted learning activities (Davis, 2020). Overall, the impact of renewable energy solutions on effective management of universities and other institutions of higher learning extends beyond financial considerations, encompassing environmental sustainability and the resilience of educational infrastructure.

Disturbingly, despite the crucial importance of green building practices and renewable energy solutions among others in controlling the human actions that have been causing climate to react of recent, a disconcerting number of university administrators appear oblivious to their existence. Even among those who may have some awareness, there seems to be a lack of understanding regarding the substantial benefits the implementation of these policies could bring to the advancement of their universities and the broader community, particularly in terms of eco-sustainability. In light of this disconcerting situation, the researchers undertook an investigation to assess the extent to which smart climate change policies impact on effective management of Joseph Sarwuan Tarka University, Makurdi - Nigeria.

### **Statement of the Problem**

Effective management of university education is crucial, given its goals of equipping students with comprehensive knowledge, critical thinking and research skills in their chosen fields, fostering personal and intellectual growth and instilling a commitment to civic responsibility, ethical awareness, and lifelong learning for future professional success and societal contributions. Over the past two decades, the management of university education seems to have faced challenges related to climate change related elements such as excessive rainfall leading to flooding of schools and families, excessive heat that seems to cause discomfort among students and teachers, excessive cold resulting in illness and class absences among learners and poor visibility that appears to affect both students' performance and teacher-learners interaction. To address these issues and create a conducive learning environment, researchers are advocating for the adoption of smart climate change polices such as green building practices and renewable energy solutions. While the potential impact of these polices on the management of Joseph Sarwuan Tarka University, Makurdi - Nigeria and other institutions of higher learning in Benue State and Nigeria is acknowledged, the specific nature and extent of this impact, along with associated opportunities, require a comprehensive assessment. The researchers aim to evaluate how smart climate change polices have influenced the effective management of Joseph Sarwuan Tarka University, Makurdi, intending to provide insights for informed policy and practice in the education sector. It is against this background that the researchers assessed the extent of impact of smart climate change polices on effective management of Joseph Sarwuan Tarka University, Makurdi - Nigeria.

**Purpose of the Study**

The purpose was to investigate the extent to which the implementation of smart climate change polices had impacted on effective management of Joseph Sarwuan Tarka University, Makurdi - Nigeria. Specifically, the study sought to:

1. Find out the extent to which green building practices impact on effective management of Joseph Sarwuan Tarka University, Makurdi, Nigeria.
2. Examine the extent to which the use of renewable energy solution impact on effective management of Joseph Sarwuan Tarka University.

**Research Questions**

The following research questions guided the study:

1. To what extent do green building practices impact effective management of Joseph Sarwuan Tarka University, Makurdi, Nigeria?
2. To what extent do the use of renewable energy solutions impact on effective management of Joseph Sarwuan Tarka University?

**Hypotheses**

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. Green building practices has no significant impact on effective management of Joseph Sarwuan Tarka University, Makurdi, Nigeria.
2. The use of renewable energy solutions has no significant impact on effective management of Joseph Sarwuan Tarka University.

**II. Methodology**

The study adopted a descriptive survey design. The population comprised 85 staff (12 principal staff and 73 Senior Administrative staff) from Joseph Sarwuan Tarka University, Makurdi. The Census sampling technique was used to take all the 85 employees for the study. This is because the population is relatively small and manageable, making it feasible to collect data from each member.

Implementation of Smart Climate Change Policy Questionnaire (ISCCPQ) was used for data collection. The questionnaire was divided into Sections A and B. Section A contained items on the personal data of the respondents, while Section B was divided into two clusters – I and II. Cluster I contained items 1-5 that bordered on the extent of impact of green building practices on effective management of Joseph Sarwuan Tarka University, Makurdi, Nigeria. Cluster II contained items 6-10 on the extent of impact of the use of renewable energy solutions on effective management of Joseph Sarwuan Tarka University.

Two experts from the Faculties of Education and Department of Geography all from Benue State University, Makurdi validated the instrument and the questionnaire was pilot tested and analyzed using Cronbach Alpha to determine the internal consistency and reliability co-efficient, which yielded 0.82. The decision was based on the real limits of numbers. Hence a mean response score of 3.50-4.00 was considered Very High Extent (VHE), 2.50-3.49 High Extent (HE), 1.50 -2.49 Low Extent (LE), while 0.50-1.49 was considered as Very Low Extent (VLE). The data collected were analyzed using Mean Scores and Standard Deviation to answer the research questions. Any item with less than 2.50 was rejected and considered as having low or positive impact. On the other hand, it was accepted as having high and positive impact if it was 2.50 and above. Chi-Square was used to test the hypotheses at 0.05 level of significance.

**III. Data Analysis And Interpretation**

The data were analyzed and interpreted in response to the research questions and hypotheses.

**Research Question 1:** To what extent do green building practices impact effective management of Joseph Sarwuan Tarka University, Makurdi, Nigeria?

**Table 1:**  
Mean Ratings and Standard Deviations of the Extent of Impact of Green Building Practices on Effective Management of Joseph Sarwuan Tarka University, Makurdi

S/No	ITEM DESCRIPTION	VHE	HE	LE	VLE	M	SD	Dec.
1	My university encourages rainwater harvesting that enhance irrigation needs.	25	33	16	11	2.85	0.99	High Extent
2	In my university, plumbing and landscaping is practice to minimize/ control erosion.	23	42	13	7	3.05	0.72	High Extent
3	My university recycle waste to reduce the cost of production.	29	38	9	9	3.02	0.94	High Extent
4	My university emphasizes proper ventilation during building design and construction to	22	51	7	5	3.06	0.76	High Extent

	improve classroom comfort for students and teachers.							
5	Afforestation is encouraged to preserve natural features in my university.	30	41	11	3	3.15	0.78	High Extent
	<b>Cluster Mean</b>					<b>3.03</b>		<b>High Extent</b>

Source: Researchers' Field Survey Results (2023)

Table 1 revealed that the mean ratings of items 1-5 are 2.85, 3.05, 3.02, 3.06 and 3.15 with the corresponding standard deviations of 0.99, 0.72, 0.94, 0.76 and 0.78. Item by item analysis shows that the respondents unanimously agreed that their university encourages rainwater harvesting that enhance irrigation needs, respondents also stated that plumbing and landscaping is practice in their university to minimize/ control erosion. The respondents were of the opinion that their university recycle waste to reduce the cost of production. In addition, they also agreed that their university emphasize proper ventilation during building design and construction to improve classroom comfort for students and teachers. Moreso, the respondents agreed that in their university, afforestation is encouraged to preserve natural features. The table had a cluster mean of 3.03, which is above the cut-off point of 2.50; and the standard deviations were closely related, indicating homogeneity. This demonstrated to a high extent how green building practices has impacted the effective management of Joseph Sarwuan Tarka University in Makurdi, Nigeria.

**Research Question 2:** To what extent do the use of renewable energy solutions impact on effective management of Joseph Sarwuan Tarka University?

**Table 2:**  
Mean Ratings and Standard Deviations of the Extent of impact of Use of Renewable Energy Solutions on Effective Management of Joseph Sarwuan Tarka University.

S/No	ITEM DESCRIPTION	VHE	HE	LE	VLE	M	SD	Dec.
6	The installation of a solar farm eliminated the cost of electricity, allowing my university to redirect resources to other areas of need.	22	50	8	5	3.05	0.77	High Extent
7	The installation of solar energy at my university has reduced the time spent by staff processing student results due to power outages.	21	42	13	9	2.88	0.91	High Extent
8	The installation of a solar plant has provided students with access to free internet 24 hours a day, which has improved their academic performance in my university.	25	40	14	6	2.99	0.87	High Extent
9	The use of renewable energy solutions appears to have reduced carbon emissions and contributed to a greener, healthier learning environment.	21	34	18	12	2.75	0.99	High Extent
10	The installation of a solar farm has eliminated the problem of power outages, which previously disrupted classroom learning activities.	31	40	9	5	3.14	0.83	High Extent
	<b>Cluster Mean</b>					<b>2.96</b>		<b>High Extent</b>

Source: Researchers' Field Survey Results (2023)

Table 2 showed that the mean ratings of items 6-10 are 3.05, 2.88, 2.99, 2.75 and 3.14 with the corresponding standard deviations of 0.77, 0.91, 0.87, 0.99 and 0.83. The table revealed that respondents had agreed that the installation of a solar farm eliminated the cost of electricity, thereby allowing their university to redirect resources to other areas of need and that the installation of solar energy at their university has reduced the time spent by staff processing student results during power outages. They also agreed that the installation of a solar plant has provided students with access to free internet 24 hours a day, thereby improving their academic performance. The respondents unanimously agreed that the use of renewable energy solutions appears to have reduced carbon emissions and contributed to a greener, healthier learning environment. Moreso, that the installation of a solar farm has eliminated the problem of power outages, which used to disrupt classroom learning activities. The cluster mean of 2.96 was found to be above the cut-off point of 2.50. The standard deviations were closely related, suggesting homogeneity. Thus, indicating high extent of the use of renewable energy solutions on effective management of Joseph Sarwuan Tarka University.

**Hypothesis 1:** Green building practices has no significant impact on effective management of Joseph Sarwuan Tarka University, Makurdi, Nigeria.

**Table 3:**

*Chi-Square Analysis of the Extent of Impact of Green Building Practices on Effective Management of Joseph Sarwuan Tarka University, Makurdi, Nigeria*

Responses	VHE	HE	LE	VLE	Total	df	$\chi^2$ cal.	P-val.	Remark
Observed	26	41	11	7					
					85	3	33.918 <sup>a</sup>	.000	Significant
Expected	21.3	21.3	21.3	21.3					

**Source:** *Researchers' Field Survey Results (2023)*

Table 3 shows that  $\chi^2$ -cal.= 33.918<sup>a</sup>;  $P < .05$  with 3 degree of freedom. Thus, the null hypothesis which states that green building practices has no significant impact on effective management of Joseph Sarwuan Tarka University, Makurdi, Nigeria was rejected. This result clearly shows that green building practices have a significant impact on the effective management of Joseph Sarwuan Tarka University, Makurdi, Nigeria.

**Hypothesis 2:** The use of renewable energy solutions has no significant impact on effective management of Joseph Sarwuan Tarka University.

**Table 4:**

*Chi-Square Analysis of the Extent of Impact of Use of Renewable Energy Solutions on Effective Management of Joseph Sarwuan Tarka University.*

Responses	VHE	HE	LE	VLE	Total	df	$\chi^2$ cal.	P-val.	Remark
Observed	24	41	12	8					
					85	3	31.000 <sup>a</sup>	.000	Significant
Expected	21.3	21.3	21.3	21.3					

**Source:** *Researchers' Field Survey Results (2023)*

Table 4 shows that  $\chi^2$ -cal.=31.000<sup>a</sup>;  $P < .05$  with 3 degree of freedom. Thus, the null hypothesis which states that the use of renewable energy solutions has no significant impact on effective management of Joseph Sarwuan Tarka University was rejected. This demonstrates that the use of renewable energy solutions has significant impact on the effective management of Joseph Sarwuan Tarka University.

#### IV. Discussion Of Findings

The first finding of this study revealed that that green building practices have a significant impact on the effective management of Joseph Sarwuan Tarka University, Makurdi, Nigeria. This finding is so due to the university's promotion of sustainability through rainwater harvesting, plumbing and landscaping to mitigate erosion, as well as waste recycling to reduce production. The findings align with Brown and Smith's (2020) research, indicating that integrating green building elements in higher education institutions enhances management efficiency and fosters improved indoor environmental quality, positively affecting the well-being and performance of students and staff for a healthier and more conducive learning environment, with a focus on strategically positioned structures to offer natural ventilation and health-related benefits. Furthermore, Williams (2020) reported that incorporating green building practices into higher education institutions not only supports broader educational objectives by instilling environmental stewardship in students, but also serves as educational tools, promoting sustainability, resource conservation, and a culture of environmental responsibility both on and off campus. promoting sustainability, resource conservation, and a culture of environmental responsibility both within and beyond the university campus. The current research aligns with both Brown and Smith's (2020) and Williams' (2020) research findings, despite their differing times and locations, as it underscores the scientific principle that adopting eco-friendly policies fosters a human-friendly environment conducive to habitation.

The second finding also revealed that the use of renewable energy solutions has significant impact on the effective management of Joseph Sarwuan Tarka University. This finding is attributed to the installation of a solar farm, which not only eliminated electricity costs, enabling resource redirection, but also eliminates the problem of power outages, which previously disrupted classroom learning activities. This finding supports John's (2020) discovery that implementing renewable energy sources, such as solar power, leads to cost savings and increased energy efficiency. This, in turn, improves the financial sustainability of such institutions, allowing resources to be redirected toward educational programmes and facility improvements. Thereby positively influencing overall institutional management. Furthermore, Davis (2020) emphasizes that incorporating renewable energy in schools increases resilience to power outages, ensuring uninterrupted learning, with renewable energy solutions not only benefiting university management financially but also promoting

environmental sustainability and educational infrastructure resilience. This is to say that the current study supports previous research findings because all institutions that install solar energy reduce the cost of institutional governance while also providing a conducive environment for teachers and students.

## **V. Conclusion**

The study examined the effects of climate change on education and society as a whole, as well as the benefits of implementing smart climate policies such as green building and renewable energy at Joseph Sarwuan Tarka University in Makurdi, Nigeria. By incorporating these policies into institutional management, the study evaluated their impact on creating a conducive teaching and learning environment for students and teachers in the face of challenges such as extreme heat and cold. It emphasizes the global urgency of addressing climate change and offers suggestions for strengthening educational institutions' resilience to climate-related challenges.

## **VI. Recommendations**

Based on the findings, this study recommended that:

1. Educational authorities and policymakers should prioritize the integration of green building practices and renewable energy solutions, pointing to the possibility of improved governance and functionality for university education facilities not only at Joseph Sarwuan Tarka University in Makurdi, but also in institutions across Nigeria and around the world.
2. All tertiary institutions should build network with government agencies, non-governmental organizations and industries to gain access to funding, technical expertise and resources for green building initiatives and projects. They should also learn how to recycle their waste products in order to reduce environmental pollution; by designing buildings, managing waterways and planting trees, they can control extreme heat and cold, as well as operational costs. This will also make the environment more hospitable for both humans and animals.
3. The pilot study conducted at Joseph Sarwuan Tarka University in Makurdi, Nigeria, demonstrates that installing a solar plant is not only environmentally friendly, but also improves university management effectiveness. As a result, university administrators should seek collaboration with government and non-governmental organizations to invest in on-campus renewable energy infrastructure, such as solar panels, wind turbines, or geothermal systems. This investment can help reduce the university's reliance on fossil fuels, lower long-term energy costs, and promote environmental sustainability.
4. It is also recommended that institutions that have already adopted these policies foster a culture of continuous improvement by regularly reviewing and updating green building policies, practices, and technologies to stay abreast of sustainability advancements and maximize environmental and financial benefits.

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