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Influence of Climatic Factors on Student Well-being in Selected Schools in Ibadan

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Abstract
Climate change is a global issue that arises from a combination of anthropogenic activities and natural phenomena. Floods, rainstorms, and high temperatures are natural disasters that have a negative impact on the general wellbeing of people. The prevalence of climatic factors on school infrastructure leads to increased anxiety and fear among individuals, thereby impacting their overall wellbeing. Thus, the study examined the influence of climatic factors (flood, rainstorm, and high temperature) on student's wellbeing in selected schools in Ibadan. A non-experimental research type with an ex-post factor design was used because the schools' climatic circumstances had previously occurred. Eight schools were purposely chosen for the study, while 410 pupils were randomly picked. Two self-reporting scale was developed to collect data from study participants. The instruments' reliability indices are 0.78 and 0.80, respectively, after Cronbach alpha testing. The study found that climatic conditions significantly impact student and teacher's wellbeing in Ibadan schools ($F(3, 406) = 21.869$, $p < 0.05$). The study found that climatic conditions in selected Ibadan schools affect student and teacher's well-being.

Keywords: Climate Change, Flood, Rainstorm, High Temperature, Wellbeing

Introduction
Changes in weather and temperature are part of global climate change (Shivanna, 2022). Burning fossil fuels and deforestation release greenhouse gases that trap heat and raise global temperatures. Climate change is human-caused, according to the 1993 UN Framework Convention on Climate Change (Fawzy, Osman, Doran and Rooney, 2020). These changes alter atmospheric composition and increase climate variability. Human activity has increased climate change since the Industrial Revolution (Hoegh-Guldberg et al., 2019). Greenhouse gas emissions from fossil fuel combustion and deforestation have raised Earth's surface temperature unprecedentedly. Changes in weather, biology, and natural cycles affect life on Earth (Amit et al., 2024). Rising flood frequency and intensity are a major result of climate change (Angra and Sapountzaki, 2022).
According to Wang and Degol (2016), climate change has a major and complex impact on education, providing several difficulties that disrupt learning and lower educational success. Climate change intensifies severe weather events such as strong precipitation, floods, high winds, and hailstorms, affecting education (Clarke, Otto, Stuart-Smith and Harrington, 2022). These severe weather events endanger kids and educators and have long-term effects on schooling.
Drought and rising temperatures affect agricultural production, causing crop losses and food shortages (Cotrina Cabello et al., 2023). Malnutrition hinders pupils' capacity to remember information and function effectively in school, which lowers intellectual achievement. Due to food shortages, kids may feel compelled to work or support their families, which increases school absenteeism. Extreme weather events reduce safe drinking water and sanitation, increasing the risk of weather-related diseases such as malaria and diarrhoea (Nichols, Lake and Heaviside, 2018). Children often miss school due to illness, which hinders learning. Girls are disproportionately affected by water collection, which hinders their ability to attend classes and complete homework (Fonjong and Zama, 2023).

In addition, climate change exerts secondary impacts on schooling, which arise from the responses and adjustments of households to evolving environmental circumstances. In response to climate-related issues, various techniques have emerged as prominent means of coping, including income supplements, relocation, and child marriages (Awiti, 2022).

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Consequently, classrooms that have been affected by severe weather events are rendered inoperable during the rainy season, necessitating the abandonment of classes and resulting in higher dropout rates as families move to safer regions or prioritise alternative means of earning a living. Furthermore, unfavourable weather conditions reduce the motivation of teachers to work in regions prone to flooding or drought, resulting in a scarcity of skilled educators and a high ratio of students to teachers (Apollo and Mbah, 2021). The reliance on relief instructors who lack consistency in their teaching approaches undermines the quality of education and interrupts the continuity of the learning process in schools. As a result, climate-affected regions see a high prevalence of poor educational results, such as increased rates of repeat years and school dropouts.

Floods, which may be caused by excessive precipitation or the overflow of rivers, can significantly affect both students and teachers in schools (Mu, Luo, Lyu, Zhou, Huo, Duan, and Zhao, 2021). Floods have the potential to significantly disrupt educational institutions, resulting in detrimental effects on infrastructure and resources (Ramli et al., 2020). Additionally, educators are faced with the responsibility of providing emotional support to students who have experienced trauma, as well as the challenge of modifying instructional strategies in the aftermath of such events. The societal expectation to swiftly return to a state of normalcy and the individual experiences of personal losses resulting from floods contribute to the emotional weight carried by affected individuals.

Rainstorms, common in Ibadan and its environments, can disrupt school routines and infrastructure, leading to increased stress levels among students and teachers (Kabwe, 2022). The unpredictability of rainstorms, such as sudden heavy downpours and strong winds, can cause anxiety and fear, particularly for those who had experienced traumatic events related to severe weather conditions before School closures and the displacement of students due to flooding or infrastructure damage can further contribute to stress and disrupt learning environments (Sims, 2021).

High temperatures, particularly during dry season and in the absence of rain, can also affect students and teachers in schools (Li et al., 2022). Extreme heat can cause physical discomfort, dehydration, and heat-related illnesses, impacting the ability to concentrate and learn effectively (Habib et al., 2021). High temperatures can lead to increased stress levels, fatigue, and decreased productivity among students and teachers. Vulnerable individuals, such as those with pre-existing health conditions or limited access to cooling facilities, may be at a higher risk of experiencing negative effects on mental health and well-being.

Research Questions

1. To what extent does flood affect school infrastructure and facilities in selected schools in Ibadan?
2. To what extent does rainstorm affect school infrastructure and facilities in selected schools in Ibadan?
3. To what extent does high temperature affect teaching and learning in selected schools in Ibadan?
4. Is there a joint significant influence of climatic factors on student's wellbeing in selected schools in Ibadan?

Methodology

The study adopted an ex-post facto research design to evaluate the influence of climatic and psychosocial factors on the wellbeing of students and teachers in schools located in Ibadan, Oyo State. Ex-post factor design was selected because of the nature of the independent variables (climatic factors) of the study which necessitated a non-experimental research approach. Manipulating climatic stressors, such as rainstorm, floods, and high temperature among students would not be feasible or ethical. As such, the ex-post factor design allowed for the examination of the influence of these naturally occurring factors on wellbeing without intervening in the natural order of events. The population of the study consisted of senior secondary school students of the selected schools in Ibadan.

Multi-stage sampling technique was adopted for the study. A purposive sampling technique was

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used to select a representative sample of schools in Ibadan that have experienced varying levels of exposure to the climatic factors under investigation. Selection of schools were based on their geographical location and their history of exposure to flood, rainstorm, and high temperature events. The validation criteria for the selected schools are; schools with blown roofs, schools with abandoned classroom blocks, schools whose fields have been washed away by flood. Eight (8) schools were purposively selected from a huge number of schools that have experienced various climatic conditions. The eight schools were selected because they had the most prolific impact of flood and rainstorm on the school buildings and infrastructure. At the second stage, simple random sampling method was used to randomly select 410 senior secondary schools' students from the selected schools to be part of the study.

The prevalence of climatic factors scale was developed by the researcher to generate responses from the study participants to measure the prevalence of adverse climatic conditions specifically flood, rainstorm and high temperature on school infrastructure and school facilities. The scale is a self-reporting scale which consisted of three sub-sections which are flood, rainstorm and high temperature. The sub-section has 10, 7 and 8 items respectively. A Likert response format such as very often, often, sometimes and never was adopted by the researcher to elicit responses from individual participants of the study.

Assessment of student's wellbeing scale is a self-reporting scale which was used to measure the overall wellbeing of students and teachers who participated in the study. Twenty (20) items were developed by the researcher to measure the physical, mental, social, and emotional wellbeing of students and teachers. A Likert response format such as very much like me, like me, unlike me, and very much unlike me was adopted by the researcher to assess the wellbeing state of the study participants individually.

The instruments for the study were validated through face validity, content validity and construct validity. Experts assessed the scale and the items generated to be sure they are suitable for generating accurate responses that will help answer the research questions guiding the study. The reliability test was conducted with Cronbach alpha and the reliability indices of the instruments are 0.78 and 0.80 respectively. The reliability indices show good reliability which implies that the scale is reliable to collect data

The researcher individually administered the self-reporting scale, with the help of other research assistants in each school, to students in the selected schools, while individual student provided responses to the items in the instrument. The researcher explained the variables of interest before the participants started providing responses to the self-reporting scale. The researcher then retrieved the instrument from individual persons when they finished providing responses to items on the scale.

Frequency count and percentages were used to analyse the prevalent climatic factors and the wellbeing of students and teachers in the selected schools in Ibadan. Multiple linear regression analysis was also used to assess the combined influence of the three climatic factors on students' wellbeing in the selected schools in Ibadan.

Results

Research question One: To what extent does flood affect school infrastructure and facilities in selected schools in Ibadan?

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Table 1. Extent to which Flood Affects School Infrastructure and Facilities in Selected Schools in Ibadan

S/N	Items	VO F (%)	O F (%)	S F (%)	N F (%)	M	SD
1	Classes are usually merged as a result of collapse of school buildings and infrastructures.	106 (25.9)	36 (8.8)	168 (23.9)	2 (0.5)	2.36	1.121
2	Flood affect the functionality of school facilities.	104 (25.4)	43 (10.5)	158 (38.5)	98 (23.9)	2.34	1.147
3	Classroom blocks collapse and are completely destroyed by flood.	67 (16.3)	73 (17.8)	141 (34.4)	129 (31.5)	2.19	1.055
4	Flood leads to the loss of educational materials and teaching aids.	96 (23.4)	56 (13.7)	96 (23.4)	161 (39.3)	2.21	1.198
5	My school is closed down during raining season due to frequent occurrences of flood.	28 (6.6)	16 (3.9)	37 (9.0)	327 (79.8)	1.37	0.856
6	There is insufficient teaching aids and materials in my school because they have been destroyed by flood.	101 (24.6)	28 (6.8)	77 (18.8)	203 (49.5)	2.06	1.248
7	Classrooms are flooded during heavy downpour.	96 (23.4)	46 (11.2)	117 (28.5)	149 (36.3)	2.21	1.180
8	Students are displaced from their classrooms due to flood.	96 (23.4)	33 (8.0)	122 (29.8)	157 (38.3)	2.16	1.323
9	Huge gullies and ridges have been created on the school compound as a result of flood.	128 (31.2)	54 (13.2)	61 (14.9)	158 (38.5)	2.33	1.323
10	The school field has been completely washed away by heavy downpour.	131 (32.0)	30 (7.3)	53 (12.9)	188 (45.9)	2.21	1.359

The descriptive analysis shows that floods significantly affect school infrastructure and facilities in selected schools in Ibadan. A notable percentage of respondents indicate that floods lead to the collapse of classroom blocks (16.3% strongly agree), displace students from classrooms (23.4% strongly agree), and destroy educational materials (23.4% strongly agree). Classrooms are often flooded during heavy downpours (23.4% strongly agree), while the merging of classes due to collapsed infrastructure is also a concern (25.9% strongly agree). The mean values across these items range from 2.06 to 2.36, reflecting a moderate level of impact on the functionality and condition of school buildings and facilities, as floods disrupt school activities and create unsafe learning environments.

Additionally, floods lead to severe structural damage and displacement, with huge gullies and ridges being created on school compounds (31.2% strongly agree), and the complete washing away of school fields (32.0% strongly agree). However, the most striking impact is seen in school closures during the rainy season, with 79.8% of respondents agreeing that frequent floods cause schools to shut down. The low mean scores of 1.37 for this item suggests that while this is not a daily occurrence, it has a critical impact when it happens. Overall, floods pose a serious threat to the infrastructure, materials, and overall functionality of schools in Ibadan, making it difficult to maintain regular school activities during heavy rains.

Research question Two: To what extent does rainstorm affect school infrastructure and facilities in selected schools in Ibadan?

Table 2. Influence of Rainstorm on School Infrastructures in Selected Schools in Ibadan

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S/N	Items	VO F (%)	O F (%)	S F (%)	N F (%)	M	SD
1	Roofs are blown away during raining season.	160 (39.0)	72 (17.6)	93 (22.7)	84 (20.5)	2.75	1.182
2	The road linking our school is damaged and becomes un - usable during raining season.	107 (26.1)	48 (11.7)	118 (28.8)	125 (30.5)	2.28	1.229
3	School doors and windows have been destroyed by heavy rainstorm.	142 (34.6)	61 (14.9)	108 (26.3)	97 (23.7)	2.60	1.200
4	School ceilings has collapsed as a result of rainstorm.	132 (32.2)	63 (15.4)	108 (26.3)	105 (25.6)	2.53	1.199
5	Heavy rainfall has created cracks on the floors of classroom.	120 (29.3)	64 (15.6)	90 (22.0)	120 (29.3)	2.37	1.281
6	Excessive rainstorm weakens school structures, thereby making them unsafe.	143 (34.9)	76 (18.5)	113 (27.6)	74 (18.0)	2.68	1.156
7	Rainstorm causes erosion in the school compound.	226 (55.1)	60 (14.6)	58 (14.1)	63 (15.4)	3.08	1.170

The descriptive analysis reveals that rainstorms have a significant impact on school infrastructure and facilities in the selected schools in Ibadan. A considerable proportion of respondents strongly agree that roofs are blown away during the rainy season (39.0%), and school doors and windows are damaged by heavy rainstorms (34.6%). The mean values for these items (M = 2.75 and M = 2.60, respectively) indicate a moderate to high frequency of these occurrences. Furthermore, 32.2% of respondents strongly agree that rainstorms cause ceilings to collapse, and 29.3% note the creation of cracks in classroom floors, showing that rainstorms frequently cause substantial damage to various parts of school buildings.

Additionally, the analysis shows that rainstorms weaken the overall structural integrity of schools. Excessive rainstorms weaken school buildings (34.9% strongly agree), making them unsafe for use. A particularly severe issue is erosion, as 55.1% of respondents strongly agree that rainstorms cause erosion in the school compound, with a mean value of 3.08, indicating a frequent and significant problem. Roads linking schools also become unusable during the rainy season, as reported by 26.1% of respondents. These findings highlight the widespread and destructive effects of rainstorms on school infrastructure, posing serious challenges to the safety and functionality of school environments in Ibadan.

Research question Three: To what extent does high temperature affect teaching and learning in selected schools in Ibadan?

Table 4.3. Influence of High Temperature on Teaching and Learning in Selected Schools in Ibadan.

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S/N	Items	VO F (%)	O F (%)	S F (%)	N F (%)	M	SD
1	Extreme heat leads to loss of concentration of students and teachers during lessons.	173 (42.2)	58 (14.1)	76 (18.5)	89 (21.7)	2.70	1.190
2	Students and teachers feel uncomfortable when the weather is extremely hot.	178 (43.4)	50 (12.2)	107 (26.1)	73 (17.8)	2.80	1.190
3	Students and teachers are restless during afternoon classes.	135 (32.9)	63 (15.4)	82 (20.0)	115 (28.0)	2.46	1.301
4	Students' attendance is usually low during afternoon periods.	128 (31.2)	43 (10.5)	113 (27.6)	126 (30.7)	2.42	1.219
5	Teachers stay away from afternoon periods.	60 (14.6)	49 (12.0)	97 (23.7)	191 (46.6)	1.88	1.134
6	Students and teachers are less motivated to engage in learning activities during afternoon periods.	71 (17.3)	72 (17.6)	118 (28.8)	139 (33.9)	2.13	1.136
7	High temperature disrupts school schedules.	100 (24.4)	57 (13.9)	99 (24.1)	144 (35.1)	2.23	1.231
8	Teachers move students to shady areas to seek cover from the hot temperature.	64 (15.6)	49 (12.0)	72 (17.6)	215 (52.4)	1.86	1.162

The descriptive analysis shows that high temperature significantly affects teaching and learning in selected schools in Ibadan. A substantial percentage of respondents believe that extreme heat impacts concentration, with 42.2% strongly agreeing that it leads to loss of focus for both students and teachers during lessons. Similarly, 43.4% strongly agree that the discomfort caused by extreme heat makes the learning environment challenging. Afternoon classes appear to be particularly affected, as 32.9% strongly agree that students and teachers become restless, and 31.2% agree that students' attendance drops during these periods. The mean values for these items (ranging from 2.42 to 2.80) indicate a moderate to high level of agreement on the disruptive effects of heat on concentration, attendance, and restlessness.

Furthermore, the data suggest that the motivation to engage in learning activities declines during hot afternoons. For instance, 33.9% of respondents note that both students and teachers are less motivated, and 46.6% strongly agree that teachers often avoid afternoon sessions. Teachers also tend to move students to shaded areas (52.4%), highlighting how heat disrupts school schedules and learning routines. The relatively lower mean values for items like teachers avoiding afternoon periods (M = 1.88) and moving students to shady areas (M = 1.86) suggest that while these coping strategies are evident, they are less frequent compared to other responses. Overall, the analysis shows that high temperatures severely affect teaching and learning by causing discomfort, reducing concentration, and disrupting normal school activities, especially in the afternoons.

Research question Four: Is there a joint significant influence of climatic factors on students and teachers' wellbeing in selected schools in Ibadan?

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Table 4.4. Multiple Linear Regression showing the Influence of Climatic Factors on Students' Wellbeing

R = 0.373
R^2 = 0.139
Adjusted R^2 = 0.133
Standard Error = 9.967

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1		6516.892	3	2172.297	21.869	0.000b
	Residual	40329.764	406	99.334		
	Total	46846.656	409			

a Dependent Variable: Students' Wellbeing
b Predictors: (Constant), Flood, High Temperature, Rainstorm (Climatic Factors)

Table 4.11a shows the result of the Multiple Linear regression analysis conducted to examine the influence of the predictor variable-climatic factors (flood, rainstorm and high temperature) on student's wellbeing in selected schools in Ibadan. The result of the analysis shows that there is a significant influence of climatic factors on student's wellbeing in selected schools in Ibadan ($F(3, 406) = 21.869$, $p < 0.05$). The result shows that the prevalence of adverse climatic condition has an influence on student's wellbeing in schools in Ibadan. The Adjusted R Square = 0.133 which indicates that the predictor variable accounts for 13.3% of the variation that occurred in the dependent variable (student's wellbeing). The result implies that the occurrence of adverse climatic conditions has a significant influence on student's wellbeing in selected schools in Ibadan. Table 4.4b shows the relative contribution of the climatic factors on student's wellbeing in selected schools in Ibadan.

Table 4.4b. Relative Contribution of Climatic Factors on Student's Wellbeing

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	45.478	1.675		27.152	0
Flood	0.135	0.091	0.098	1.487	0.138
Rainstorm	0.260	0.127	0.143	2.048	0.041
High Temperature	0.271	0.092	0.184	2.941	0.003

Dependent Variable: Students' Wellbeing

The table presents the relative contribution of climatic factors—flood, rainstorm, and high temperature—on students' wellbeing. Flood, with a Beta of 0.098, shows a weak and statistically non-significant impact on wellbeing ($p = 0.138$, $p > 0.05$), indicating that flood occurrences do not have a meaningful effect on students' wellbeing in this model. In contrast, rainstorm (Beta = 0.143, $p = 0.041$, $p < 0.05$) has a moderate and statistically significant positive influence, meaning that rainstorms contribute to a notable change in students' wellbeing. High temperature shows the strongest impact (Beta = 0.184, $p = 0.003$, $p < 0.05$), reflecting a significant and relatively more substantial effect compared to the other factors. Therefore, high temperature emerges as the most influential climatic factor affecting students' wellbeing, followed by rainstorm, while the impact of flooding is minimal and not

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statistically significant.

Discussion of findings

The findings of the study shed light on the profound influence of climatic factors on the wellbeing of students in selected schools in Ibadan, Nigeria. Drawing upon relevant literature, it is evident that natural disasters, including floods and rainstorms, pose significant challenges to school infrastructure and operations, this study is consistent with previous research documenting the vulnerability of educational facilities to extreme weather events. Studies conducted by Codjoe et al. (2020) and the UNDRR (2019) have highlighted the prevalence of structural damages, such as collapsed buildings and eroded compounds, underscoring the urgent need for resilient infrastructure and climate adaptation measures to ensure a safe and conducive learning environment for all stakeholders.

Furthermore, the study reveals the psychosocial ramifications of climatic factors on individuals within the school community, echoing findings from existing literature on the emotional and psychological impacts of environmental stressors. Researchers such as Clayton et al. (2020) and Brooks et al. (2019) have observed the experience of anxiety, pressure, and unhappiness in response to adverse weather events, reflecting the psychological strain placed on students and teachers. This highlights the importance of addressing mental health needs within the educational context, as emphasised by Berry et al. (2018) and Lowe et al. (2015). The disruption to emotional equilibrium and coping mechanisms observed underscores the imperative of integrating mental health support services into climate resilience initiatives to enhance individuals' adaptive capacity and wellbeing, as indicated by studies conducted by Fritz et al. (2019) and Alexander et al. (2018).

Despite the challenges posed by climatic events, the study also identifies instances of resilience and adaptive responses within school communities, highlighting the importance of proactive measures to mitigate the impact of environmental hazards. Scholars such as Martin et al. (2022) and Rana et al. (2022) have explored these adaptive responses, emphasising the need for communities to build resilience in the face of climatic challenges. However, gaps in preparedness and infrastructure underscore the need for targeted interventions to enhance climate adaptation and disaster risk reduction capacities within educational institutions, as discussed by Birkmann et al. (2020) and the IPCC (2021).

Conclusion

This study provides valuable insights into the intricate connection between climatic factors and how they influence the wellbeing of students in selected schools located in Ibadan, Nigeria. This research provides a thorough analysis of the various environmental stressors that individuals encounter in educational settings. It highlights the complex challenges that people face when navigating the educational landscape in the face of climatic adversities.

The physical infrastructure of schools and the wellbeing of students were significantly affected by climatic factors such as floods, rainstorms, and high temperatures. This study highlights the significant impact of environmental stressors on educational operations. It emphasises the structural damages, disrupted classroom dynamics, and decreased attendance rates that occur during extreme weather events (Smith et al., 2020; Hsiang et al., 2019).

Recommendations

The study's findings on the influence of climatic factors on the wellbeing of students in selected schools in Ibadan suggest several recommendations to tackle the identified challenges and foster resilience within educational environments. The following is recommended to policy makers and school administrators:

- The government should allocate resources towards investments in constructing resilient school buildings and infrastructure capable of withstanding severe weather phenomena, including floods, rainstorms, and high temperatures.
- The government should engage in modifying and improving current buildings,

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as well as integrating climate-responsive design ideas into new construction endeavours.

- To safeguard the well-being of students and teachers in the face of climatic disasters, it is imperative for policy makers to establish and execute early warning systems and emergency preparedness plans. The implementation of evacuation routes, designated shelter sites, and communication procedures is crucial in order to effectively disseminate timely information.
- School governing bodies must promote the establishment of collaborative efforts among educators, administrators, and community stakeholders in order to formulate contingency strategies aimed at ensuring the uninterrupted provision of education and facilitating student learning in the face of climatic catastrophes.

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