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## Teachers' Perception of Climate Change and its Impact on Teaching and Learning Outcomes in Public Secondary Schools in Eleme Local Government Area of Rivers State, Nigeria

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### Abstract

This study investigated the teachers' perception of climate change and its impact on teaching and learning outcomes in public secondary schools in Eleme Local Government Area of Rivers State, Nigeria. The study became necessary following the occurrences of environmental changes and climate-related events such as high temperatures, irregular precipitation patterns and flooding, which have continued to affect school activities, the teaching and learning process, and students' academic performance. The study was guided by four research questions and two hypotheses tested, aimed at assessing teachers' level of awareness and perception of climate change, its perceived effects on teaching effectiveness and learning outcomes, and highlighting challenges faced by teachers in adapting instructional practices to climate-related disruptions. The study employed a descriptive survey research design. The population consisted of public secondary school teachers in Eleme, of which a sample of 170 was drawn using the random and stratified sampling technique via the researchers' developed instrument titled Teachers' Perception of Climate Change Questionnaire (TPCCQ). The instrument was validated by experts, while reliability was established using Cronbach's alpha method, yielding a coefficient above 0.70. Data collected were analysed using the mean and standard deviation to answer the research questions. The results revealed that the teachers possess a moderate to high level of awareness of climate change and perceived it as having significant impacts on school attendance, classroom comfort, instructional time, and students' concentration and academic achievement. The study further showed that limited and deplorable infrastructure, lack of climate-responsive school policies, and limited professional training on environmental education had a significant effect on effective teaching and learning during climate-related events. However, adaptive teaching strategies and increased environmental awareness were identified as supportive measures for improving learning outcomes. The study concluded that climate change significantly affects teaching and learning processes in public secondary schools in Eleme. It was therefore recommended that educational authorities should integrate climate education into the curriculum, provide teachers with training on climate adaptation strategies, and improve school infrastructure to support resilient learning environments.

**Keywords:** Teachers' Perception, Climate Change, Impacts, Teaching and Learning Outcomes.

### Introduction

The world today is facing a climate crisis that is affecting every aspect of our lives and livelihoods. The scale and extent of climate change have become one of the most pressing global challenges of the twenty-first century, affecting both natural and human systems worldwide. Climate change refers to significant and long-term alterations in global

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weather patterns characterised by rising temperatures, changing precipitation patterns, increasing frequency of floods, droughts, heat waves, sea-level rise, and other extreme weather events. These alterations are known to be driven by human activities like the burning of fossil fuels, industrialisation, gas flaring, tree felling and environmental degradation (IPCC,2023). The phenomenon has continued to exert profound effects on socio-economic sectors like agriculture, health, transportation, energy, the economy, and education.

It has become increasingly obvious in recent times that the educational sector is now one of the sectors threatened by climate-related disruptions. Educational institutions are exposed to environmental hazards such as flooding, excessive heat, erosion, storms, and irregular rainfall patterns that can negatively affect teaching and learning processes. As reported by Sabarwal (2024), extreme weather events often lead to school closures, interruption of academic calendars, loss of instructional time, and deterioration of learning outcomes. Similarly, UNICEF (2024) reported that climate crises disrupted the education of approximately 242 million students across 85 countries, demonstrating the growing impact of climate change on educational systems around the globe. These disruptions affect students' attendance, teachers' effectiveness, and the overall quality of educational delivery.

The link between climate change and educational outcomes has attracted increasing scholarly attention. A recent study by Sabarwal (2024) shows that high classroom temperature can lower learners' attention rate, memory retention, and cognitive ability, thus affecting their educational achievement. It was reported that flooding, storms, and other climate-induced disasters often destroy school infrastructure, displace learners, and limit access to educational opportunities (World Bank, 2024). It is against this background that climate change is now recognised by many scholars and development experts as not only an environmental concern but also as a huge educational challenge requiring strategic policy responses and institutional resilience for both impact mitigation and adaptation. The pivotal roles of teachers in transmitting knowledge, building skills, and inculcating valued societal morals are critical within the educational system. Their awareness and understanding of climate change are particularly important because this influences how they respond to environmental challenges and integrate climate-related knowledge into classroom instruction. Leve, Michel and Harms (2023) opined that climate literacy among teachers encompasses knowledge, skills, attitudes, and competencies necessary for addressing climate-related challenges in educational settings. Teachers with adequate climate literacy are more likely to adopt adaptive teaching strategies, promote environmental awareness, and encourage sustainable behaviours among students.

### Conceptual Review

This study is anchored on the concepts of Climate Change, Teachers' Perception, Climate Change and Teaching Outcomes, and Climate Change and Learning Outcomes. Concept of Climate Change: The phenomenon termed climate change refers to long-term alterations in temperature, precipitation patterns, wind systems, and other aspects of the Earth's climate system over extended periods. The Intergovernmental Panel on Climate Change (IPCC, 2023) defines climate change as persistent changes in the climate that can be recognised through statistical analyses of variations in weather conditions over several decades or longer. Climate change is largely attributed to human activities such as fossil fuel combustion, industrialisation, deforestation, gas flaring, and environmental degradation, which increase greenhouse gas concentrations in the atmosphere. According to NASA (2024), global temperatures have risen significantly over the past century due to increased emissions of carbon dioxide, methane, and other greenhouse gases. These climatic changes manifest through rising temperatures, erratic rainfall patterns, flooding, droughts, sea-level rise, heat waves, and severe storms. Such environmental changes affect both ecological systems and human societies. In developing countries, climate change presents significant socioeconomic and developmental challenges. The World Bank (2024) observed that climate-related disasters contribute to poverty, food insecurity, displacement, and infrastructural damage. In Nigeria, climate change is evident through recurrent flooding, erosion, desertification, coastal degradation, and increasing temperatures, especially in already environmentally fragile regions such as the Niger Delta. Within the educational sector, climate change affects school facilities like buildings, furniture, aesthetic school landscapes, etc., teaching schedules, learning environments, and educational outcomes. Understanding climate change is therefore essential for developing adaptation strategies capable of reducing its adverse effects on educational systems.

### Teachers' Perceptions of Climate Change

Teachers' perception of climate change refers to educators' understanding, beliefs, attitudes, awareness, and

interpretations regarding the causes, consequences, and solutions to climate change. Perception influences how teachers respond to environmental issues and integrate climate-related concepts into teaching and learning activities. Leve, Michel, and Harms (2023) describe climate literacy among teachers as the combination of knowledge, competencies, attitudes, and skills necessary for understanding climate change and promoting sustainable behaviours. Teachers who possess adequate climate knowledge are more likely to encourage environmental responsibility among students and adopt adaptive instructional strategies.

UNESCO (2024) further noted that although climate change topics have been incorporated into many educational curricula globally, successful implementation depends largely on teachers' attitudes, understanding, and willingness to engage learners in climate discussions. Consequently, teachers' perceptions constitute an important determinant of climate change awareness among students. Understanding teachers' perceptions is particularly important in environmentally vulnerable areas such as Eleme Local Government Area, where climate-related challenges directly affect educational activities and community livelihoods.

#### Climate Change and Teaching Outcomes

Teaching outcomes refer to the totality of factors such as the effectiveness of instructional processes, classroom management, content delivery, and teacher productivity that are germane to the overall achievement of educational objectives. Climate change can influence teaching outcomes through its effects on the physical and psychological conditions under which teachers perform their duties. According to Sabarwal (2024), extreme temperatures lower teachers' concentration, morale, and productivity. Excessive classroom heat creates discomfort that may affect lesson preparation, classroom engagement, and instructional effectiveness. Similarly, climate-induced disasters such as floods and storms can interrupt school operations, such as reduced visibility during cloudy weather, causing coldness, anxiety, etc., leading to loss of instructional time.

The World Bank (2024) reported that damaged educational infrastructure resulting from flooding and environmental degradation often disrupts academic schedules and limits teachers' ability to deliver lessons effectively. Teachers may also experience increased stress and emotional strain during climate-related extreme conditions and emergencies. ODI (2026) observed that climate-related uncertainties contribute to anxiety and psychological stress among educators. Such conditions can negatively influence teaching quality, job satisfaction, and professional commitment. Consequently, climate change represents an emerging challenge to effective teaching and educational service delivery. In the context of Eleme LGA, environmental pollution from oil and gas activities, indiscriminate waste disposal, flooding, and heat exposure may significantly affect teachers' instructional performance and overall educational effectiveness.

#### Climate Change and Learning Outcomes

Learning outcomes refer to the knowledge, skills, attitudes, competencies, and academic achievements acquired by students through educational processes. Climate change affects learning outcomes both directly and indirectly through disruptions to educational environments. Sabarwal (2024) found that high classroom temperatures reduce students' attention span, memory retention, and cognitive functioning. When students are exposed to excessive heat, their ability to process information and participate actively in learning activities may decline. UNICEF (2024) reported that climate-related disasters disrupted the education of approximately 242 million students globally, leading to school closures, absenteeism, and learning losses. Such disruptions negatively affect academic progress and educational attainment. The World Bank (2024) further observed that flooding and environmental degradation often damage school facilities and learning resources, thereby reducing access to quality education. Students in climate-vulnerable communities may experience irregular attendance due to transportation difficulties and displacement. Furthermore, ODI (2026) highlighted the psychological effects of climate-related disasters on learners, including stress, anxiety, and emotional distress. These conditions can reduce academic engagement and overall educational achievement. Therefore, climate change constitutes a significant threat to learning outcomes in public secondary schools.

#### Theoretical Framework

The study is hinged on three theoretical frameworks, which are the environmental stress theory advanced by Lazarus and Cohen (1977), the systems theory developed by Ludwig von Bertalanffy (1968) and the theory of planned behaviour (TPB), which was developed by Ajzen (1991). These theories explained the dynamics of humans and

environmental conditions and how environmental conditions are capable of influencing human behaviours, and vice versa. The systems theory highlights the interconnected system of all human spheres within a broader ecosystem, in which an alteration in one component affects the other. According to the theory of planned behaviour (TPB), it was noted that one's attitude, perceptions, and beliefs influence one's intentions, behaviours or actions. Individuals are more likely to engage in behaviours or actions when they have positive attitudes, supportive social norms, and perceived control over actions. Therefore, in environmental and climate change education, the teachers' perceptions go a long way to influence their tendency and capacity to teach environmental concepts and adopt adaptation strategies.

Climate change-related occurrences have become recurring episodes in Rivers State through flooding, excessive heat, irregular rainfall, environmental pollution, and erosion. These events have affected many public secondary schools by disrupting academic activities, damaging school facilities, reducing attendance rates, and creating unconducive learning environments. Regardless of the increasing occurrence of these climate-related events, there is limited empirical information regarding how teachers in public secondary schools in Eleme Local Government Area perceive climate change and its effects on teaching and learning outcomes. Many schools continue to experience environmental disruptions without adequate adaptation strategies. Consequently, teachers may find it difficult to effectively prepare lesson notes, deliver lessons, and mark assignments, while students may experience poor concentration, absenteeism, truancy and reduced academic performance.

The problem this paper seeks to address is how teachers' perceptions of climate change and its attendant effects affect them as teachers in teaching and learning outcomes among the students in public secondary schools in Eleme Local Government Area of Rivers State. This study is aimed at examining the teachers' perceptions concerning the varying issues of climate change and its effects on teaching and learning in Eleme Local Government Area of Rivers State. Specifically, the study was undertaken through the following objectives, which are to find out the:

1. level of teachers' perceptions concerning climate change in public secondary schools in Eleme Local Government Area;
2. impacts of teachers' perceptions towards climate change on their teaching and instructional practices;
3. effects of climate change on students' learning environment and outcomes;
4. coping strategies teachers employ to address climate-related disruptions in the school system.

This study was guided by the following research questions:

1. What are teachers' perceptions of climate change in public secondary schools in Eleme Local Government Area?
2. How do teachers perceive the impact of climate change on their teaching and instructional practices?
3. What are the effects of climate change on students' learning environment and outcomes?
4. What are the coping strategies teachers employ to address climate-related disruptions in the school system?

Thus, the following hypothesis was tested at a 0.05 significance level

H<sub>01</sub>: There is no significant relationship between teachers' perception of climate change and teaching outcomes in public secondary schools in Eleme Local Government Area.

H<sub>02</sub>: There is no significant relationship between teachers' perception of climate change and students' learning outcomes in public secondary schools in Eleme Local Government Area.

## Methods and Materials

Eleme, known as a major oil and gas industrial zone, is one of the local government areas in Rivers State, Nigeria is located east of Port Harcourt and part of the Greater Port Harcourt Metropolitan area. Geographically, Eleme is located at latitude 4° 42' 40'' N and 4° 53' 20'' N and longitude 7° 01' 20'' E and 7° 10' 40'' E, respectively. The landmass covers an area of 138 km<sup>2</sup> (Ngofa, 2006), with an estimated population of 400 thousand. The area is gradually becoming an emerging town, attracting people from both rural and urban centres because of the oil and gas industrial activities (Udogu, 2005). A descriptive survey research design was adopted for the study because it allows the researchers to collect information from teachers regarding their perceptions of climate change and its impacts on teaching and learning. The population consists of all teachers in public secondary schools in Eleme Local Government Area of

Rivers State, Nigeria. A sample population of 170 teachers across 22 public Senior Secondary and Junior Secondary Schools in Eleme was selected using simple random sampling and proportionate sampling techniques to ensure fair representation of respondents from different schools, out of which a total of 190 questionnaires were distributed; 170 were correctly collected and analysed, representing 89% of the sampled data population, as shown in the Table Below. Data were collected using a structured questionnaire titled Teachers' Perception of Climate Change and Teaching-Learning Outcomes Questionnaire (TPCCTLOQ). Research questions were analysed using Mean and Standard Deviation, while hypotheses may be tested using Pearson product-moment correlation or Chi-square statistics at a 0.05 level of significance.

## Results

**Table 1: Displaying the Mean and Standard Deviation of teachers' perceptions of climate change in public secondary schools in Eleme Local Government Area**

| S/N               | Statements                                        | SA | A  | SD | D  | Mean ( $\bar{x}$ ) | SD          | Decision    |
|-------------------|---------------------------------------------------|----|----|----|----|--------------------|-------------|-------------|
| 1.                | Teachers understand the concept of climate change | 78 | 52 | 18 | 12 | 3.23               | 0.86        | High        |
| 2.                | Aware of causes of climate change                 | 72 | 58 | 20 | 10 | 3.20               | 0.82        | High        |
| 3.                | Difference between weather and climate            | 75 | 55 | 19 | 11 | 3.21               | 0.84        | High        |
| 4.                | Environmental impacts                             | 69 | 60 | 21 | 10 | 3.18               | 0.81        | High        |
| 5.                | Social/economic effects                           | 74 | 54 | 22 | 10 | 3.20               | 0.85        | High        |
| <b>Grand Mean</b> |                                                   |    |    |    |    | <b>3.20</b>        | <b>0.84</b> | <b>High</b> |

KEY: SA- Strongly agreed, A- Agreed, SD- Strongly disagreed, D- Disagreed.

The grand mean of 3.20 with a standard deviation of 0.8 indicates that Teachers generally understand climate change concepts, especially in the environmental impacts and human contribution. However, training and curriculum integration are weak, which suggests a need for professional development.

**Table 2: Displaying Mean and Standard Deviation of Teachers' Perception of Impact on Teaching**

| S/N               | Questionnaire Items                           | VHE | HE | VLE | LE | Mean ( $\bar{x}$ ) | SD          | Decision    |
|-------------------|-----------------------------------------------|-----|----|-----|----|--------------------|-------------|-------------|
| 1                 | Climate change affects teaching effectiveness | 65  | 61 | 24  | 10 | 3.13               | 0.83        | High        |
| 2                 | Extreme heat affects teaching                 | 70  | 55 | 23  | 12 | 3.14               | 0.89        | High        |
| 3                 | Reduces instructional time                    | 63  | 60 | 25  | 12 | 3.09               | 0.86        | High        |
| 4                 | Modify lesson plans                           | 67  | 58 | 24  | 11 | 3.13               | 0.85        | High        |
| 5                 | Influences teaching methods                   | 68  | 57 | 23  | 12 | 3.13               | 0.87        | High        |
| <b>Grand Mean</b> |                                               |     |    |     |    | <b>3.20</b>        | <b>0.85</b> | <b>High</b> |

KEY: VHE- Very great extent, HE- High extent, VLE- Very low extent, LE- Low extent

This section operates with a grand mean of 3.20 and a standard deviation of 0.85, indicating a high extent among respondents; however, teachers perceive climate change as affecting teaching and instructional delivery, particularly through heat, school closures, and lesson adaptation. Motivation is somewhat affected but less pronounced.

**Table 3: Displaying the mean and Standard Deviation of observed effects of climate change on students' learning environment and outcomes**

| S/N               | Statements                             | SA | A  | SD | D  | Mean ( $\bar{x}$ ) | SD          | Decision      |
|-------------------|----------------------------------------|----|----|----|----|--------------------|-------------|---------------|
| 1.                | High temperature affects concentration | 76 | 53 | 21 | 10 | 3.22               | 0.83        | Agree         |
| 2.                | Extreme weather affects attendance     | 73 | 56 | 20 | 11 | 3.19               | 0.84        | Agree         |
| 3.                | Affects academic performance           | 71 | 58 | 19 | 12 | 3.18               | 0.86        | Agree         |
| 4.                | Poor ventilation affects learning      | 75 | 54 | 20 | 11 | 3.21               | 0.84        | Agree         |
| 5.                | Disasters damage school facilities     | 74 | 55 | 19 | 12 | 3.19               | 0.86        | Agree         |
| <b>Grand Mean</b> |                                        |    |    |    |    | <b>3.20</b>        | <b>0.85</b> | <b>Agreed</b> |

KEY: SA- Strongly agreed, A- Agreed, SD- Strongly disagreed, D- Disagreed.

The section presented a grand mean of 3.20 with a standard deviation of 0.85, which indicates that the respondents generally agreed that there is a significant impact of climate change on the learning environment and outcomes. The students' learning is clearly affected by climate change, especially through temperature, attendance, stress, and health challenges. Teachers recognise both environmental and academic effects.

**Table 4: Displaying the Mean and Standard Deviation of Coping Strategies used by the Teachers to address climate-related disruptions in the school system**

| S/N | Statements                                           | A  | S  | R  | N  | Mean ( $\bar{x}$ ) | SD   | Decision |
|-----|------------------------------------------------------|----|----|----|----|--------------------|------|----------|
| 1.  | Climate Change Education and Environmental Awareness | 69 | 59 | 21 | 11 | 3.16               |      | Moderate |
| 2.  | Development of Climate-Resilient Infrastructure      | 72 | 56 | 20 | 12 | 3.18               |      | Moderate |
| 3.  | Environmental Conservation and Afforestation         | 70 | 58 | 21 | 11 | 3.17               |      | Moderate |
| 4.  | Encourage eco-friendly behavior                      | 74 | 54 | 21 | 11 | 3.19               |      | Moderate |
| 5.  | Climate-Smart Educational Systems                    | 71 | 57 | 20 | 12 | 3.17               |      | Moderate |
|     | <b>Grand Mean</b>                                    |    |    |    |    | 3.17               | 0.85 | Moderate |

KEY: A- Always, S-Sometimes, R- Rarely, N- Never

This section displayed a grand mean of 3.17 with a standard deviation of 0.85, which indicates a moderate extent among respondents. However, this indicated that Teachers employ various coping strategies, mostly adjusting schedules, flexible teaching, behaviour modifications and awareness programs. Resource-intensive strategies (technology, collaboration, initiatives) are less common.

**Table 5: Difference in the significant relationship between teachers' perception of climate change and teaching outcomes in public secondary schools in Eleme Local Government Area.**

| Hypothesis      | Tool      | r-calculated | r- critical ( $p=0.05$ ) | Decision              |
|-----------------|-----------|--------------|--------------------------|-----------------------|
| H <sub>01</sub> | Pearson r | 0.278        | 0.105                    | Reject H <sub>0</sub> |

Statistically indicates a significant difference in the level of understanding/ perception of climate change among teachers in Eleme Local Government Area. Since the calculated Pearson value (0.278) is greater than the critical r-value (0.105), the null hypothesis was rejected. This implies that there is a significant relationship between teachers' perception of climate change and teaching outcomes in public secondary schools in Eleme Local Government Area. In practical terms, teachers are engaged in their teaching profession, but they are affected by climate change. However, students' learning is clearly affected by climate change, especially through temperature, attendance, stress, and health challenges.

## Conclusion

The findings suggest that teachers generally perceive climate change as a serious environmental challenge affecting educational processes. Climate change significantly influences teaching effectiveness and students' learning outcomes through flooding, excessive heat, pollution, and disruption of academic activities. Climate change has emerged as a significant environmental and educational challenge affecting public secondary schools in Eleme Local Government Area of Rivers State. Teachers generally perceive climate change as a reality that negatively influences teaching and learning processes. Environmental challenges such as flooding, excessive heat, pollution, and irregular weather conditions contribute to reduced instructional effectiveness, poor student attendance, and declining learning outcomes. Addressing these challenges requires collective efforts from government, educational planners, school administrators, teachers, parents, and environmental agencies. By improving climate change awareness, strengthening school infrastructure, and promoting sustainable environmental practices, the negative impacts of climate change on education can be significantly reduced.

## Recommendations

1. The government should provide climate-resilient school infrastructure capable of withstanding flooding and extreme weather conditions.
2. Classrooms should be properly ventilated to reduce the effects of excessive heat on teachers and students.
3. Climate change education should be incorporated into secondary school curricula.
4. Regular seminars, workshops, and training programmes should be organised to improve teachers' knowledge of climate change and adaptation strategies.
5. Tree planting and environmental sustainability programmes should be encouraged in schools.
6. School authorities should develop climate adaptation and disaster preparedness plans.
7. Government and environmental agencies should reduce industrial pollution and gas flaring in communities around Eleme.
8. Educational stakeholders should collaborate with environmental organisations to promote climate awareness among students and teachers.

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