

**ASSESSMENT OF GLOBAL WARMING AND HUMAN HEALTH IN AKWA IBOM AND ENUGU STATES: INVESTIGATING THE DEPENDABLE CONTROLS AND REMEDIAL STRATEGIES OF THE MENACE FOR A HEALTHY HUMAN ENVIRONMENT**

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**ABSTRACT**

*The study was carried out to assess global warming and human health in Akwa Ibom and Enugu States as well as investigating the dependable controls and remedial strategies of the menace for a healthy human environment. A descriptive survey design was used for this study. The study areas for this research are Akwa Ibom and Enugu States, which are two of the thirty-six (36) states of the Federal Republic of Nigeria. The target population for this study was all the environmental scientists and medical personnel in Enugu and Akwa Ibom States. In this research, a stratified random sampling technique was used to select a sample size of one hundred and eighty (180) environmental scientists and medical personnel, comprising 50 environmental scientist and 40 medical personnel from each of the 2 states. The researcher used an instrument tagged "Global Warming and Human Health Questionnaire (GWHHQ)". The instrument was subjected to face and content validation by one expert in environmental management and another in medicine. A pilot test was carried out on 40 respondents (made up off 25 environmental scientists and 15 medical personnel) from other one state that did not form part of the main study. The instrument was administered to the respondents via direct delivery method. The Researcher ensured that the instrument was properly filled only by the targeted respondents and retrieved immediately to ensure 100% retrieval case. Independent t-test analysis was used in testing the hypotheses at the significance level of 0.05 alpha level. The results were considered significant if calculated t-value was either equal to or greater than the critical t-value and vice versa the null hull hypotheses were upheld. This study a significant difference in the extent of global warming experiences between Akwa Ibom and Enugu States. It also showed significant difference in the causes of Global Warming, health related issues, effects, strategic ways of mitigating and remedial strategies between Akwa Ibom and Enugu States.*

*One of the recommendations was that both states should establish reliable climate-health monitoring systems that track temperature changes, flooding patterns, air quality, and the incidence of climate-sensitive diseases. Early warning systems for heatwaves, malaria, cholera, and respiratory infections will enable timely interventions.*

**KEYWORDS:** Global Warming, Human Health, Healthy Human Environment, Remedial Strategies, Inhibiting Factors, Akwa Ibom State and Enugu State.

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**INTRODUCTION**

The term "global warming" describes the gradual rise in Earth's average surface temperature brought on by human activity, specifically the release of greenhouse gases (GHGs). This phenomenon is an important part of climate change, which includes a wider variety of environmental changes like rising sea levels, altered precipitation patterns, and an increase in the frequency of extreme weather

events. It is also thought to be defined by the consistent rise in the average surface temperature of the Earth, which has become a serious issue with profound implications for human and environmental health. This phenomenon is largely attributed to anthropogenic greenhouse gas (GHG) emissions, which include carbon dioxide, methane, and nitrous oxide, resulting primarily from industrial activities, agriculture, and deforestation (Smith et al., 2021). However, human activities, particularly the burning of fossil fuels (coal, oil, and natural gas), deforestation, and industrial processes, have significantly increased the concentration of these gases in the atmosphere, enhancing the greenhouse effect and contributing to global warming. According to Ekpenyong, (2013), the greenhouse effect is a natural process where certain gases in the Earth's atmosphere trap heat, keeping the planet warm enough to support life. Furthermore, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and fluorinated gases are the most prevalent greenhouse gases. Energy production, transportation, agriculture, deforestation, and waste management are some of the causes of greenhouse gas emissions. Ecosystems, agriculture, water resources, and human health are all impacted by the various ecological changes that result from global warming. According to the Intergovernmental Panel on Climate Change (IPCC), tropical and subtropical regions are disproportionately affected by the severe and unequally distributed health risks linked to climate change.

According to Patz & Olson (2020), the environment in which people live, work, and play is inextricably tied to human health. Clean air, safe drinking water, proper sanitation, and a stable climate are all components of a healthy environment, and they are all necessary for fostering health and wellbeing. Numerous biological, physical, and social factors can either improve or worsen health outcomes in the complex interaction between human health and the environment. A healthy environment includes a nutritious environment, climate stability, water quality and sanitation, and air quality, which is essential for respiratory health. Furthermore, respiratory illnesses, cardiovascular issues, and a shortened life expectancy can result from poor air quality, which is frequently caused by pollution from industrial processes, automobile emissions, and the burning of fossil fuels. According to the World Health Organization (2019), heart disease and strokes brought on by fine particulate matter (PM<sub>2.5</sub>) and other pollutants are the main causes of the estimated 4.2 million premature deaths that outdoor air pollution causes globally each year. Additionally, since the WHO estimated that 2 billion people lack access to safe drinking water, which can result in serious health problems like cholera, dysentery, and other gastrointestinal infections, access to safe drinking water and proper sanitation are essential for preventing waterborne diseases. The environment has an impact on social determinants including employment, education, and income. For instance, there are frequently health disparities in locations with high pollution levels and lower socioeconomic status. Better sanitation and water quality can improve community health outcomes and lessen the burden of disease. The state of the environment has a significant impact on both individual and community health. In addition to preventing illness, maintaining a healthy environment is crucial for fostering general wellbeing. Improving public health requires initiatives to build healthier metropolitan areas, provide access to nutrition, and produce cleaner air and water. A sustainable future where human health can flourish depends on addressing environmental issues through research, education, legislation, and community involvement.

Global warming presents both direct and indirect health hazards in Nigeria, particularly in the states of Akwa Ibom and Enugu, which calls for a strong framework for assessment and action. Geographical, economic, and infrastructure-related weaknesses make these states particularly vulnerable, exacerbating health risks from food instability, vector-borne illnesses, and heat stress. Furthermore, the lack of adaptive infrastructure and resilience strategies in these regions compounds

the adverse impacts on public health (Okafor et al., 2019). Therefore, a focused study evaluating the health effects of global warming in Akwa Ibom and Enugu is necessary to develop effective and long-lasting control measures. The health and well-being of citizens in Akwa Ibom and Enugu states are impacted by the apparent change in climatic patterns. For instance, increased rainfall variability, rising temperatures, and shifts in humidity levels contribute to the proliferation of vector-borne diseases, such as malaria and dengue fever, which thrive under these environmental conditions (Eze et al., 2020). Additionally, food production and water supplies are disrupted by extreme weather events like droughts and floods, endangering nutritional security and putting communities at risk for waterborne infections.

The intricate relationship between health and environmental deterioration in these states emphasizes the necessity of multifaceted research methodologies. Notably, industrialization and urbanization have intensified pollution levels, both atmospheric and terrestrial, which contribute to respiratory illnesses, cardiovascular diseases, and other chronic conditions prevalent among vulnerable populations (Agholor et al., 2022). Because of their increased vulnerability to environmental hazards, Akwa Ibom and Enugu urgently require reliable controls and corrective measures that address the underlying causes of climate change as well as its effects on human health. A strong study technique is required in order to evaluate the effects of global warming on human health in the states of Akwa Ibom and Enugu, Nigeria. This includes the application of epidemiological studies, climate data analysis, and health impact assessments (HIAs) to evaluate correlations between climate variables and health outcomes (Obasi & Iwuala, 2021). In order to provide insights for focused treatments, researchers can find patterns that point to climate-sensitive health hazards by combining satellite climate data with local health information. Additionally, through the integration of local knowledge and lived experiences into the assessment framework, participatory approaches engaging community stakeholders can improve the validity of findings.

At the local, state, and federal levels, concerted efforts are needed to address the issues of global warming and promote a healthy environment in Akwa Ibom and Enugu States. Both states can increase climate change resilience and provide a healthier environment for their citizens by boosting renewable energy sources, encouraging sustainable agriculture, upgrading water management, and involving communities. In order to advance these projects and eventually support sustainable development and better public health in Nigeria, cooperation between the government, non-governmental organizations, and local communities will be essential. Building resilience to health crises brought on by climate change also requires policy changes targeted at bolstering emergency response and public health infrastructure (Ekpenyong, 2013). At the local level, educational initiatives and public awareness campaigns can help communities embrace sustainable practices and join the fight against climate change. The complex relationships between environmental deterioration and human well-being are demonstrated by the health effects of global warming in the states of Akwa Ibom and Enugu. This study intends to provide important insights that guide policy decisions and advance a healthier, more resilient society by examining the unique vulnerabilities of these areas and recommending efficient control strategies.

## **STATEMENT OF PROBLEM**

Global warming poses an increasingly severe threat to both the environment and human health worldwide, with significant impacts in regions like Akwa Ibom and Enugu States. Rising temperatures, changing weather patterns, and increased frequency of extreme weather events are accelerating environmental degradation in these areas. These changes affect air quality, water resources, and food

security, all of which are crucial for sustaining human health. Despite growing awareness of the issue, the local impact on public health is often overlooked, leading to insufficient measures and inadequate public health responses. This lack of attention exacerbates the vulnerabilities of residents who are frequently exposed to health risks arising from the deteriorating environment, including respiratory issues, vector-borne diseases, and food and waterborne illnesses.

Human health in Akwa Ibom and Enugu States is particularly susceptible due to limited access to effective mitigation and adaptation strategies for global warming. There is a pressing need to assess the availability and reliability of controls and remedial strategies that could lessen the negative health impacts. Local responses are often hindered by limited resources, inadequate information on health risks associated with climate change, and insufficient integration of environmental and health policies. Although some policies exist at national and state levels, they are generally fragmented, poorly implemented, or not targeted to meet the unique needs of Akwa Ibom and Enugu. Consequently, individuals in these regions remain vulnerable to escalating health issues directly linked to global warming, which, if unaddressed, could worsen over time.

Addressing this gap, this study seeks to investigate dependable controls and remedial strategies that can be implemented in Akwa Ibom and Enugu States to promote a healthier environment. By assessing current mitigation efforts, exploring community-specific health impacts, and examining the effectiveness of existing interventions, this research aims to identify strategic measures that can be realistically adopted to counteract the negative effects of global warming on health. Findings from this study are expected to contribute valuable insights into improving environmental policies, enhancing public health frameworks, and building resilience against climate-related health challenges in these two regions.

## **JUSTIFICATION OF THE STUDY**

The rationale for this study emerges from the urgent need to address the escalating health and environmental challenges associated with global warming in Akwa Ibom and Enugu States. As these regions experience worsening climate conditions such as rising temperatures, unpredictable rainfall patterns, and more frequent extreme weather events the adverse impacts on public health are becoming increasingly severe. Traditional environmental and health management approaches may no longer be adequate, highlighting the necessity for dependable control measures and effective remedial strategies that can mitigate the impact of global warming. This study seeks to evaluate and analyze such measures, aiming to establish a sustainable framework that other regions facing similar challenges can adopt, thus fostering healthier human environments. Global warming is not only a threat to the environment but also a major public health concern in Akwa Ibom and Enugu, where residents face heightened risks of respiratory illnesses, vector-borne diseases, and other climate-related health issues. The study will examine current mitigation efforts and health interventions, identifying gaps and opportunities for improvement that can be tailored to these communities. By focusing on strategies that have proven effective or show promise within similar contexts, this research aims to create actionable insights that support local governments, health practitioners, and policymakers in crafting more resilient environmental health policies. This approach will contribute to a broader understanding of how climate control methods can be optimized for health benefits, ultimately reducing the health risks posed by climate change. By conducting a thorough assessment of global warming's impact on human health in these states and investigating the dependability of current and potential strategies, the study will provide a valuable resource for those working to safeguard public health against climate-related hazards. The findings are expected to aid in developing an integrated response model, one that aligns

environmental protection with health priorities to create safer, more resilient communities. In doing so, this study will not only address immediate health risks but also contribute to the long-term sustainability of Akwa Ibom and Enugu's environment, setting a precedent for climate adaptation efforts across Nigeria.

### **OBJECTIVES OF THE STUDY**

The primary objective of this study is to assess the impact of global warming on human health in Akwa Ibom and Enugu States, by investigating the dependable controls and remedial strategies of the menace for a healthy human environment. The specific objectives of the study will be to:

- Find out the extent of global warming experiences in Akwa Ibom and Enugu States.
- Assess the causes of Global Warming in Akwa Ibom and Enugu States.
- Examine the extent of health related issues of global warming in Akwa Ibom and Enugu States.
- Determine the effects of Global Warming on Human Health in Akwa Ibom and Enugu States.
- Find out the strategic ways of mitigating Global warming occurrence in Akwa Ibom and Enugu States.
- Assess the remedial strategies to Global Warming its effects in Akwa Ibom and Enugu States.

### **RESEARCH QUESTIONS**

The following research questions will guide the study:

- What is the extent of global warming experiences in Akwa Ibom and Enugu States?
- What are the causes of Global Warming in Akwa Ibom and Enugu States?
- To what extent of health related issues is caused by global warming in Akwa Ibom and Enugu States?
- What is the effect of Global Warming on Human Health in Akwa Ibom and Enugu States?
- What are the strategic ways of mitigating Global warming occurrence in Akwa Ibom and Enugu States.
- What are the remedial strategies to Global Warming and its effects in Akwa Ibom and Enugu States.

### **HYPOTHESES**

The following hypotheses will be used in this study:

- H0:** There is no significant difference in the extent of global warming experiences between Akwa Ibom and Enugu States.
- H0:** There is no significant difference in the causes of Global Warming in Akwa Ibom and Enugu States.
- H0:** There is no significant difference in the extent of health related issues of global warming in the two states.
- H0:** There is no significant effect of Global Warming on human health in Akwa Ibom and Enugu States.
- H0:** There is no significant difference in the strategic ways of mitigating Global warming occurrence between Akwa Ibom and Enugu States.
- H0:** There is no significant difference in the remedial strategies adopted by the two states against Global Warming effects.

**LITERATURE REVIEW**

This chapter presents the review of the related literature under the appropriate sub-headings:

**CONCEPTUAL REVIEW**

**CONCEPT OF HUMAN HEALTH**

Human health is more than just the absence of disease; it is a holistic understanding that incorporates physical, mental, and social well-being. The World Health Organization (WHO) defines health as a state of complete physical, mental, and social well-being, not just the absence of disease or infirmity (WHO). (2020) this definition highlights the importance of a more comprehensive understanding of what it means to be healthy, as it has evolved in recent years to recognize that health involves not only biological factors but also behavioral, environmental, and socio-economic aspects. For instance, a study by Goh et al. (2019) articulates health as the ability to adapt and self-manage in the face of social, physical, and emotional challenges. This definition broadens the traditional perspectives on health by highlighting the importance of resilience and adaptability in preserving health.

**CONCEPT OF HEALTHY HUMAN ENVIRONMENT**

The concept of a healthy human environment emphasizes how people interact with their surroundings and how environmental factors affect health outcomes. Clean air and water, proper sanitation, safe housing, and green spaces are all components of a healthy environment that promote well-being. According to the world Health Organization (WHO, 2021), environmental health is the branch of public health that is concerned with all aspects of the natural and built environment that may affect human health. This expansive definition emphasizes how important environmental factors are in determining health and the necessity of integrated public health strategies that take environmental determinants into account.

**CONCEPT OF GLOBAL WARMING**

Global warming is a complex environmental issue characterized by the rise in the average temperature of the Earth's surface due to increased greenhouse gas emissions. As defined by Mudelsee M. (2019), global warming refers to the increase in the Earth's average surface temperature caused predominantly by human-induced emissions of greenhouse gases, which trap heat in the atmosphere. The phrase emphasizes the distinction between the faster changes brought on by human activities like industrialization and deforestation and the natural variations in the climate.

**EFFECTS OF GLOBAL WARMING ON HUMAN HEALTH**

The environment and human health are significantly impacted by global warming, which is mostly caused by human-induced climate change. These consequences are complex and fall into two categories: direct and indirect health implications. The following are some of the effects:

**1. Increased Heat-Related Illnesses**

Heat-related illnesses are becoming more common as a result of global warming, which is also a major contributor to global temperature increases. Heatwaves increase in frequency, duration, and intensity as the average world temperature rises. Vulnerable populations, including the elderly, children, and individuals with pre-existing health conditions, are particularly susceptible (Loughnan, et.al, 2019).

**2. Respiratory Issues from Poor Air Quality**

Air quality problems are greatly worsened by global warming, which causes more people to have respiratory ailments. The production of ground-level ozone, a dangerous air pollutant, increases with rising temperatures. Asthma, bronchitis, and chronic obstructive pulmonary

disease (COPD) can all be brought on by or made worse by higher temperatures, which promote this response and raise ozone levels.

**3. Vector-Borne Diseases**

The distribution and behavior of vectors, which spread diseases like Lyme disease, dengue fever, and malaria, like mosquitoes and ticks, are impacted by global warming. These diseases can have severe health impacts, particularly in tropical and subtropical regions (Patz& Olson, 2020).

**4. Food and Water Security**

Temperature variations, altered precipitation patterns, and an increase in the frequency of extreme weather events are some of the ways that global warming impacts agricultural productivity.

**5. Mental Health Impacts**

Significant psychological repercussions of climate change include anxiety, depression, and post-traumatic stress disorder (PTSD), which are linked to climate-related tragedies and future uncertainty and are becoming more widely acknowledged. Hurricanes and floods are examples of extreme weather disasters that can cause trauma, loss of livelihoods, and displacement, all of which can have a long-term effect on mental health.

**6. Increased Incidence of Allergies**

Because of prolonged pollen seasons and greater pollen production from plants, global warming can exacerbate allergies. Longer growing seasons and increased carbon dioxide levels enhance plant growth, leading to more intense pollen seasons, which exacerbate allergic reactions and asthma (Ziska& Caulfield, 2019).

**7. Increased Risk of Natural Disasters**

Climate change is causing natural catastrophes like hurricanes, wildfires, and floods to occur more frequently and with greater intensity. These events can cause immediate physical harm, displace populations, and lead to long-term health issues due to disruption of healthcare services and increased mental health challenges (Berz, 2018).

**8. Changes in Water Quality**

The temperature and chemical makeup of water bodies can change due to climate change, which can result in contamination and dangerous algal blooms. Populations that depend on these water sources may be at serious risk for health problems as a result of this, as it may affect the safety of drinking water and raise the danger of waterborne illnesses.

**9. Displacement and Migration**

The health of people is greatly impacted by global warming, which also plays a major role in migration and displacement. Many towns are being compelled to evacuate, frequently with little notice, as a result of climate change causing increasingly frequent and severe weather events including hurricanes, floods, and droughts.

**10. Impacts on Vulnerable Populations**

The health effects of global warming disproportionately affect some groups, including indigenous peoples, low-income communities, and people with pre-existing medical issues. These groups frequently lack access to resources for environmental adaptation and healthcare.

**11. Increased Incidence of Chronic Diseases**

Chronic diseases are on the rise due to global warming, especially in regions where pollution and heat are increasing. Additionally, there is a growing correlation between it and the increased prevalence of chronic illnesses like diabetes, heart disease, and some types of cancer. This

tendency is caused by a number of climate change-related causes. First of all, heatwaves' increased frequency and severity can make pre-existing medical illnesses worse, especially cardiovascular problems.

## **CAUSES OF GLOBAL WARMING**

One of the most urgent environmental issues confronting humanity today is global warming. However, there are many other and related factors that contribute to global warming, including population expansion, energy production, deforestation, industrial operations, and agricultural practices. A thorough rundown of the main reasons is as follows:

- **Gas Emissions**

The rise in greenhouse gases, specifically carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), in the atmosphere is the main contributor to global warming. A warming effect results from these gases' ability to retain solar heat and stop it from escaping back into space.

**Carbon Dioxide (CO<sub>2</sub>):** The main cause of anthropogenic CO<sub>2</sub> emissions is the combustion of fossil fuels (coal, oil, and natural gas) for energy. These emissions are largely caused by industrial activities, transportation, and the production of power. **Methane (CH<sub>4</sub>):** Despite being present in lower amounts, methane traps heat far more effectively than CO<sub>2</sub>. Landfills, natural gas production, and agriculture especially the digestion of cattle and enteric fermentation are important sources.

**Nitrous Oxide (N<sub>2</sub>O):** Emitted from agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste, nitrous oxide has a global warming potential that is approximately 298 times greater than that of CO<sub>2</sub> over a 100-year period (IPCC, 2021).

- **Deforestation**

When it comes to removing CO<sub>2</sub> from the atmosphere, forests are essential. But logging, urbanization, and agricultural growth all contribute to deforestation, which lowers the quantity of trees that can absorb carbon. According to the Food and Agriculture Organization (FAO, 2020), approximately 10 million hectares of forest are lost each year, significantly diminishing the planet's ability to absorb CO<sub>2</sub> and exacerbates the impacts of global warming.

- **Industrial Processes**

The manufacturing of cement, steel, and chemicals is highly energy-intensive and produces large emissions of greenhouse gases (GHGs), which are released directly into the environment by many industrial processes. The World Resources Institute (WRI, 2019) reports that industrial processes account for approximately 20% of global GHG emissions, underscoring the need for cleaner technologies and practices in manufacturing.

- **Agriculture**

As is generally known, forests and trees play a vital role in maintaining climatic balance by absorbing CO<sub>2</sub> from the atmosphere, storing it, and releasing oxygen during the process of photosynthesis. Agricultural practices contribute to global warming through the release of methane and nitrous oxide (Al-Yasiri & Géczi, 2021). The key factors include:

**Livestock Production:** Methane is produced via enteric fermentation, which occurs during digestion in ruminants like cows. The Food and Agriculture Organization (FAO, 2021) estimates that livestock accounts for about 14.5% of global greenhouse gas emissions.

**Fertilizer Use:** Nitrous oxide, a powerful greenhouse gas with a potential for global warming

around 298 times greater than that of CO<sub>2</sub>, is released when nitrogen-based fertilizers are applied.

- **Waste Management**

As organic waste breaks down anaerobically (without oxygen), improper waste management techniques, especially in landfills, cause methane to be released. The United Nations Environment Programme (UNEP, 2021) highlights that waste management contributes about 3-5% of global emissions, emphasizing the need for improved waste reduction, recycling, and composting practices.

- **Land Use Changes**

By changing the Earth's surface characteristics and influencing local and global climates, changes in land use, such as urbanization and agricultural growth, are a contributing factor to global warming.

- **Energy Production and Consumption**

The main sources of greenhouse gas emissions are energy generation and consumption, especially from fossil fuels. Fossil fuels, the main source of CO<sub>2</sub> emissions, provide more than 80% of the world's energy, according to the International Energy Agency.

- **Population Growth and Economic Development**

Global warming is exacerbated by rising energy use and resource demand brought on by population growth and economic development. According to UN estimates, the world's population may approach 10 billion people by 2050, which would raise demand for resources, food, and energy.

- **Natural Causes**

Although modern global warming is mostly the result of human activity, natural forces also contribute, albeit less so:

***Volcanic Eruptions:*** Although the warming effect of large volcanic eruptions is frequently transient, they can discharge substantial volumes of ash and CO<sub>2</sub> into the atmosphere.

***Solar Activity:*** Although studies show that human-induced variables, rather than natural solar cycles, are mostly responsible for the recent global warming, changes in solar radiation can still have an impact on climate patterns.

- **Overconsumption**

Another significant factor contributing to climate change is overconsumption. In actuality, it is in charge of the excessive use of natural resources and the emissions from international freight transportation, both of which fuel climate change.

## **STRATEGIC CONTROL OF GLOBAL WARMING**

To lessen the effects of global warming and make the transition to a sustainable future, strategic restrictions are crucial. These restrictions cover a wide range of strategies, from technical advancements and legal frameworks to public participation and international collaboration.

- **Policy and Regulation**

One of the primary strategies for controlling global warming involves the establishment of robust policies and regulations. For instance, countries like Sweden and Canada have successfully implemented carbon taxes, resulting in significant emissions reductions while maintaining economic growth (Harrison, 2020).

- **Technological Innovation**

The development of technology is essential to the fight against global warming. To promote innovation in energy efficiency, carbon capture and storage (CCS), and renewable energy technology, research and development (R&D) expenditure is required.

- **Energy Transition**

Reducing global warming requires a shift from fossil fuels to renewable energy. In addition to implementing renewable energy sources like solar, wind, and geothermal, this transition calls for increases in energy efficiency in every industry. Additionally, exploring the potential of nuclear energy as a low-carbon alternative is essential, provided that safety concerns and waste management issues are adequately addressed (World Nuclear Association, 2021).

- **Land Use and Agriculture**

Land use practices significantly impact greenhouse gas emissions, making sustainable land management a key strategy in the fight against global warming. Reforestation and afforestation efforts can sequester carbon dioxide from the atmosphere, while sustainable agricultural practices can reduce emissions from the agricultural sector (Smith et al., 2014).

- **International Cooperation**

International cooperation is necessary to address the worldwide issue of global warming. Agreements like the Paris Agreement encourage international cooperation in addressing climate change and establish legally binding goals for emission reductions. Furthermore, facilitating the transfer of clean technologies to developing countries is essential for supporting their transition to low-carbon economies (Sussman et al., 2018).

- **Public Awareness and Education**

Promoting education and increasing public knowledge of climate change are essential for motivating both individual and group action. A better-informed society that recognizes the value of sustainability can be created by including climate science into school curricula.

- **Adaptation Strategies**

Building resilience against the effects of climate change requires adaptation techniques in addition to mitigation initiatives. Prioritizing infrastructure resilience will help it endure extreme weather events linked to global warming.

- **Financial Mechanisms**

When it comes to aiding climate initiatives, financial structures are essential. Green bonds, climate funds, and other financial instruments are ways that governments and financial institutions can incentivize sustainable investments.

## **REMEDIAL STRATEGIES OF GLOBAL WARMING**

One of the most urgent issues of our day is global warming, which is the notable increase in Earth's average surface temperature brought on by human activity, especially the use of fossil fuels. This phenomenon has wide-ranging effects on human health, weather patterns, sea levels, and ecosystems.

- **Transitioning to Renewable Energy**

Making the switch from fossil fuels to renewable energy sources like solar, wind, and hydropower is one of the best ways to fight global warming. By 2050, switching to renewable energy sources could cut greenhouse gas emissions by more than 70%, according to the Intergovernmental Panel on Climate Change (IPCC). The adoption of renewable not only

curbs emissions but also creates job opportunities and reduces dependence on imported fuels (Lund, 2019).

- **Enhancing Energy Efficiency**

Another key tactic is to increase energy efficiency in all sectors. The International Energy Agency (IEA) estimates that by 2040, energy efficiency initiatives could cut greenhouse gas emissions by up to 40%. Technologies like LED lighting, energy-efficient appliances, and better building insulation can help achieve this.

- **Promoting Sustainable Transportation**

One major source of greenhouse gas emissions worldwide is the transportation industry. Emissions can be considerably decreased by promoting environmentally friendly modes of transportation, such as walking, bicycling, public transportation, and electric vehicles (EVs). By 2050, broad EV adoption could reduce emissions by 70%, according to research.

- **Carbon Pricing Mechanisms**

Putting in place carbon pricing mechanisms, including cap-and-trade schemes or carbon taxes, is a financially sound way to promote emissions reductions. Countries like Sweden have successfully implemented carbon taxes, resulting in significant emissions reductions while maintaining economic growth (Andersson, 2019).

- **Reforestation and Afforestation**

Reforestation and afforestation are essential tactics in the fight against global warming since forests are essential for sequestering carbon dioxide. Various initiatives, such as the Bonn Challenge, aim to restore 150 million hectares of degraded land by 2020 (Bonn Challenge, 2021).

- **Climate-Resilient Agriculture**

The agriculture industry must reduce its carbon footprint while adjusting to the changing environment. According to the Food and Agriculture Organization (FAO), sustainable agricultural practices could mitigate up to 30% of agricultural emissions (FAO, 2019).

- **Promoting Circular Economy Practices**

Reducing waste and reusing resources are key components of a circular economy, which can greatly lower emissions related to both production and consumption. By designing products for longevity, repairability, and recyclability, businesses can minimize their environmental impact (Ellen MacArthur Foundation, 2019). By 2030, a shift to a circular economy may cut greenhouse gas emissions worldwide by 39%.

- **Public Awareness and Education**

Promoting education and increasing public understanding of climate change are essential to developing a sustainable culture. People can change their behavior and help reduce emissions by being more aware of their carbon footprints and the value of sustainable activities.

- **International Cooperation and Agreements**

The issue of global warming necessitates worldwide cooperation and agreements. The goal of the 2015 Paris Agreement is to keep the increase in global temperatures to less than 2 degrees Celsius over pre-industrial levels. To guarantee that all countries contribute to emissions reductions, ongoing participation in international climate negotiations and the creation of legally enforceable agreements are crucial.

### INHIBITING FACTORS AGAINST THE CONTROL OF GLOBAL WARMING

These elements make it more difficult to strategically manage global warming. Nonetheless, they consist of the following:

- **Policy and Regulation**

A study by Dubash and Rajamani (2018) highlights this issue, noting that "policy mechanisms frequently compromise on stringency and enforcement in pursuit of political feasibility, undermining both effectiveness and equity in climate governance.

**Political and Economic Trade-Offs:** Political and economic trade-offs impede climate policy and regulation, frequently giving short-term economic growth precedence over long-term environmental sustainability.

**Inconsistent Regulatory Frameworks:** Countries' disparate regulatory systems impede international collaboration by driving firms to areas with laxer laws, a practice referred to as "carbon leakage."

**Weakened Enforcement:** Weaker or poorly implemented policies, such as less stringent climate legislation, exemptions for specific industries, or avoiding major penalties to sustain industrial progress and prevent public reaction, might result from the trade-offs between harsh and liberal regulations.

- **Technological Innovation**

Innovation in technology is essential to the fight against global warming, both as a potential remedy and a barrier. Although it contributes to the development of cleaner energy sources and the reduction of emissions, the existing constraints pose substantial obstacles to the successful management of global warming, with key impediments having been identified.

**Lag in Renewable Energy Storage Technology:** Although renewable energy sources like solar and wind are essential for cutting greenhouse gas emissions, their sporadic nature makes them unreliable. To guarantee a consistent supply during periods of low sunlight or wind, effective energy storage technologies are required.

**High Costs and Limited Accessibility of Carbon Capture and Storage (CCS):** Emissions from fossil fuels may be decreased with carbon capture and storage (CCS) technology, which absorbs and holds CO<sub>2</sub> emissions from industrial sources.

**Slow Progress in Decarbonizing Industrial Processes:** Because of their high energy needs and industrial methods, sectors including cement, steel, and aviation have a difficult time decarbonizing.

#### **Energy Transition**

The energy transition is essential for addressing climate change, but a number of issues impede its timeliness and efficacy, making global warming control measures more difficult.

**Economic and Financial Barriers:** Large upfront investments in technology, equipment, and training are necessary to make the switch to renewable energy sources, which can be difficult for smaller enterprises and underdeveloped nations.

**Technological and Infrastructure Challenges:** Integrating renewable energy sources is difficult in many places because of the energy infrastructure's reliance on fossil fuels.

**Social and Behavioral Resistance:** Significant changes in infrastructure, lifestyle, and consumption patterns are all part of the energy transition, yet opposition may occur because of cost, convenience, or a lack of knowledge about the advantages of renewable energy.

- **Land Use and Agriculture**

Although land use and agriculture play a crucial role in the global carbon cycle, several factors

make it difficult for them to strategically limit global warming, including:

***Deforestation and Land Conversion:*** It is challenging to meet climate targets because deforestation, mostly for logging, urbanization, and agriculture, releases large amounts of carbon dioxide into the atmosphere.

***Intensive Agricultural Practices:*** Monocropping and synthetic fertilizers are two examples of modern agricultural methods that increase greenhouse gas emissions, such as methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O).

***Land Use Change for Biofuels:*** Climate goals may be at odds with changes in land usage brought about by the promotion of biofuels as a sustainable energy source. Emissions and carbon loss may increase if forests, grasslands, or agricultural area used for food production are converted to biofuel.

## **INTERNATIONAL COOPERATION**

Since climate change is a worldwide issue that cuts beyond state boundaries, international cooperation is crucial to combating global warming. A study by Keohane and Victor (2016) emphasizes these challenges, noting that international climate cooperation is often hindered by diverging national interests, the lack of binding commitments, and the influence of domestic politics on international negotiations. However, a number of obstacles inhibit strong international cooperation on climate action. The following are the crucial elements:

***Divergent National Interests:*** Depending on their economic circumstances, energy requirements, and developmental objectives, nations frequently have varied priorities. The efficacy of international accords may be diminished as a result of tensions in negotiations and compromises.

***Lack of Binding Commitments:*** International accords such as the Paris Agreement, which depend on nations' voluntary pledges rather than legally binding rules, may result in inadequate climate change mitigation.

***Political and Economic Pressures:*** A nation's commitment to international climate agreements can be greatly influenced by political variables such as electoral cycles and lobbying from the fossil fuel industry

## **Public Awareness and Education**

Strategic control of global warming is hampered by issues with public awareness, despite the fact that education and public awareness are essential for climate action.

***Misinformation and Climate Denial:*** Misinformation on climate change, which is frequently disseminated by the media or interest groups, can cause public skepticism and misunderstanding as well as a lack of knowledge about the science underlying the problem.

***Insufficient Education on Climate Issues:*** A lack of knowledge of climate change, its causes, and potential remedies results from many educational systems' inadequate integration of climate science and sustainability into their curricula.

***Disconnection from Nature and Environmental Issues:*** People and their natural surroundings are no longer connected as a result of urbanization, which makes climate issues less urgent and personally relevant.

- **Adaptation Strategies**

Strategies for adaptation are actions done to lessen the effects of climate change with the goal of minimizing damage and maximizing benefits. Nonetheless, some elements may make it more difficult to strategically manage global warming, including:

***Resource Allocation Conflicts:*** Prioritizing mitigation and adaptation initiatives is hampered by

a lack of funding and human resources in many areas. Adaptation funding frequently takes funds away from mitigation, which unbalances climate action.

***Inadequate Infrastructure and Planning:*** Planning and strong infrastructure are essential for adapting to climate change. Nevertheless, in many areas, antiquated or badly planned infrastructure makes adaptation efforts more difficult and may even encourage reactive tactics.

***Focus on Short-Term Solutions:*** Adaptation techniques frequently put immediate requirements and crises first, which results in reactive actions that put emergency responses ahead of thorough, long-term planning. This ignores the systemic adjustments required for climate resistance and successful adaptation.

- **Financial Mechanisms**

In order to combat global warming and facilitate climate action, financial mechanisms are essential. Effective climate change control measures, however, may be hampered by a number of issues pertaining to financial processes. Here are a few crucial elements:

***Inadequate Funding and Investment:*** Financial limitations prevent many developing countries from putting effective climate mitigation and adaptation plans into action, such as infrastructure improvements and renewable energy initiatives.

***Complexity and Accessibility of Funding Mechanisms:*** Stakeholders such as governments, non-profits, and local communities may find it difficult to pursue available money due to the intricacy of financial processes such as the Green Climate Fund and international climate financing projects.

***Market Volatility and Economic Instability:*** Because of economic instability, shifting fossil fuel prices, geopolitical tensions, and financial crises, global market swings can have a negative influence on investments in renewable energy and climate-related efforts.

## Theoretical Framework

### Ecosocial Theory of Disease Distribution

The Ecosocial Theory, explains how social, environmental, and biological factors interact to influence health outcomes. This theory posits that diseases and health disparities are the results of complex interactions between social determinants (like poverty or access to healthcare) and environmental factors (like climate change). In the context of Akwa Ibom and Enugu States, the Ecosocial Theory highlights how the environmental effects of global warming—such as heat stress, poor air quality, and changes in vector ecology—can exacerbate health issues, particularly among vulnerable populations. This theory supports an integrated approach to addressing global warming's health impacts by targeting both environmental conditions and socio-economic factors, thus enabling holistic interventions.

### RISK PERCEPTION THEORY

Risk Perception Theory assumed that 17 risk characteristics influence public risk perception, which can be categorized into two factors: dread and how much is known about the risk. The theory explored how individuals and communities perceive and respond to risks, especially those related to health and environmental hazards. This theory is relevant to this study because public perception of climate change risks significantly affects the adoption of remedial measures. In Akwa Ibom and Enugu, where the tangible effects of global warming may be less understood, people may undervalue the risks of climate-related health issues or lack awareness of effective control measures. By applying Risk Perception Theory, this study can better understand how local perceptions impact the effectiveness of

climate adaptation strategies and identify ways to improve risk communication. This theory also highlights the importance of community education in fostering proactive responses to climate-related health risks.

## METHODOLOGY

A descriptive survey design was used for this study. The study areas for this research are Akwa Ibom and Enugu States, which are two of the thirty-six (36) states of the Federal Republic of Nigeria. The target population for this study was all the environmental scientists and medical personnel in Enugu and Akwa Ibom States. In this research, a stratified random sampling technique was used to select a sample size of one hundred and eighty (180) environmental scientists and medical personnel, comprising 50 environmental scientist and 40 medical personnel from each of the 2 states. The researcher used an instrument tagged “Global Warming and Human Health Questionnaire (GWHHQ)”. The instrument was subjected to face and content validation by one expert in environmental management and another in medicine. A pilot test was carried out on 40 respondents (made up off 25 environmental scientists and 15 medical personnel) from other one state that did not form part of the main study. The instrument was administered to the respondents via direct delivery method. The Researcher ensured that the instrument was properly filled only by the targeted respondents and retrieved immediately to ensure 100% retrieval case. Independent t-test analysis was used in testing the hypotheses at the significance level of 0.05 alpha level. The results were considered significant if calculated t-value was either equal to or greater than the critical t-value and vice versa the null hull hypotheses were upheld.

## RESULTS OF THE DATA ANALYSIS

### Hypothesis one

The null hypothesis states that there is no significant difference in the extent of global warming experiences between Akwa Ibom and Enugu States. In order to test the hypothesis, independent t-test analysis was used to analyze the data (see table 1).

**TABLE 1**

**Independent t-test analysis of the difference in the extent of global warming experiences between Akwa Ibom and Enugu States.**

N = 180

Variable	N	$\bar{X}$	SD	t
AKWA IBOM STATE	90	18.40	0.92	19.27*
ENUGU STATE	90	15.60	1.03	

\*Significant at 0.05 level; df = 178; N= 180; critical t-value 1.984

Table 1 presents the obtained t-test-value (19.27). This value was tested for significance by comparing it with the critical t-value (1.984). at 0.05 level with 178 degree of freedom. The obtained t-value (19.27) was greater than the critical t-value (1.984). Hence, the result was significant. The result therefore means that there is significant difference in the extent of global warming experiences between Akwa Ibom and Enugu States. This result is in support of the findings of Okafor et al., (2019) who stated that global warming presents both direct and indirect health hazards in Nigeria, particularly in the states of Akwa Ibom and Enugu, which calls for a strong framework for assessment and action. The result also agreed

with the finding of Eze et al., (2020) who stated that the health and well-being of citizens in Akwa Ibom and Enugu states are impacted by the apparent change in climatic patterns. The significance of the result caused the null hypothesis to be rejected while the alternative hypothesis was upheld.

**Hypothesis two**

The null hypothesis states that there is no significant difference in the causes of Global Warming in Akwa Ibom and Enugu States. In order to test the hypothesis, independent t-test analysis was used to analyze the data (see table 2).

**TABLE 2**

**Independent t-test analysis of the difference in the causes of Global Warming in Akwa Ibom and Enugu States.**

N = 180

Variable	N	$\bar{X}$	SD	t
AKWA IBOM STATE	90	15.40	1.57	9.88*
ENUGU STATE	90	13.50	0.93	

**\*Significant at 0.05 level; df = 178; N= 180; critical t-value 1.984**

Table 2 presents the obtained t-test-value (9.88). This value was tested for significance by comparing it with the critical t-value (1.984). at 0.05 level with 178 degree of freedom. The obtained t-value (9.88) was greater than the critical t-value (1.984). Hence, the result was significant. The result therefore means that there is significant difference in the causes of Global Warming in Akwa Ibom and Enugu States. This result is in support of the findings of IPCC, (2021) emitted from agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste, nitrous oxide has a global warming potential that is approximately 298 times greater than that of CO<sub>2</sub> over a 100-year period, the result also agreed with the finding FAO, (2020) when it comes to removing CO<sub>2</sub> from the atmosphere, forests are essential. The significance of the result caused the null hypothesis to be rejected while the alternative hypothesis was upheld

**Hypothesis three**

The null hypothesis states that there is no significant difference in the extent of health related issues of global warming in Akwa Ibom and Enugu States. In order to test the hypothesis, independent t-test analysis was used to analyze the data (see table 3).

**TABLE 3**

**Independent t-test analysis of the difference in the extent of health related issues of global warming in Akwa Ibom and Enugu States.**

N = 180

Variable	N	$\bar{X}$	SD	t
AKWA IBOM STATE	90	13.40	1.36	10.00*
ENUGU STATE	90	11.60	1.03	

**\*Significant at 0.05 level; df = 178; N= 180; critical t-value 1.984**

Table 3 presents the obtained t-test-value (10.00). This value was tested for significance by comparing it with the critical t-value (1.984). at 0.05 level with 178 degree of freedom. The obtained t-value (10.00) was greater than the critical t-value (1.984). Hence, the result was significant. The result therefore means that there is significant difference in the extent of health related issues of global warming in Akwa Ibom and Enugu States.

This result is in support of the findings of WRI (2019) who examined that the manufacturing of cement, steel, and chemicals is highly energy-intensive and produces large emissions of greenhouse gases (GHGs), which are released directly into the environment by many industrial processes. According to him, he reports that industrial processes account for approximately 20% of global GHG emissions, underscoring the need for cleaner technologies and practices in manufacturing. The result also supported FAO (2020) who emphasised that when it comes to removing CO<sub>2</sub> from the atmosphere, forests are essential. But logging, urbanization, and agricultural growth all contribute to deforestation, which lowers the quantity of trees that can absorb carbon. He also approximately 10 million hectares of forest are lost each year, significantly diminishing the planet's ability to absorb CO<sub>2</sub> and exacerbates the impacts of global warming. The significance of the result caused the null hypothesis to be rejected while the alternative hypothesis was upheld.

**Hypothesis four**

The null hypothesis states that there is no significant difference in the effects of Global Warming on Human Health in Akwa Ibom and Enugu States. In order to test the hypothesis, independent t-test analysis was used to analyze the data (see table 4).

**TABLE 4**

**Independent t-test analysis of the difference in the effects of Global Warming on Human Health in Akwa Ibom and Enugu States.**

N = 180

Variable	N	$\bar{X}$	SD	t
AKWA IBOM STATE	90	15.70	1.56	10.67*
ENUGU STATE	90	13.60	1.03	

**\*Significant at 0.05 level; df = 178; N= 180; critical t-value 1.984**

Table 4 presents the obtained t-test-value (10.67). This value was tested for significance by comparing it with the critical t-value (1.984). At 0.05 level with 178 degree of freedom. The obtained t-value (10.67) was greater than the critical t-value (1.984). Hence, the result was significant. The result therefore means that there is significant difference in the effects of Global Warming on Human Health in Akwa Ibom and Enugu States. This result is in support of the opinion of WHO (2021) who examined that Global warming poses a serious threat to human health across the world, affecting both developed and developing nations. According to him the continuous increase in the Earth’s average temperature—caused by excessive emissions of greenhouse gases such as carbon dioxide, methane, and nitrous oxide—has resulted in widespread climatic changes. The significance of the result caused the null hypothesis to be rejected while the alternative hypothesis was upheld

**Hypothesis five**

The null hypothesis states that there is no significant difference in the strategic ways of mitigating Global warming occurrence in Akwa Ibom and Enugu States. In order to test the hypothesis, independent t-test analysis was used to analyze the data (see table 5).

**TABLE 5**

Independent t-test analysis of the difference in the strategic ways of mitigating Global warming occurrence in Akwa Ibom and Enugu States.

N = 180

Variable	N	$\bar{X}$	SD	t
AKWA IBOM STATE	90	14.80	1.48	8.53*
ENUGU STATE	90	13.00	1.35	

**\*Significant at 0.05 level; df = 178; N= 180; critical t-value 1.984**

Table 4.5 presents the obtained t-test-value (8.53). This value was tested for significance by comparing it with the critical t-value (1.984). at 0.05 level with 178 degree of freedom. The obtained t-value (8.53) was greater than the critical t-value (1.984). Hence, the result was significant. The result therefore means that there is significant difference in the strategic ways of mitigating Global warming occurrence in Akwa Ibom and Enugu States. The result is in support of the findings of result Adebayo and Adetunji (2021),renewable energy technologies are not only sustainable but also enhance energy security and reduce environmental degradation. The significance of the result caused the null hypothesis to be rejected while the alternative hypothesis was upheld

**4.6 Hypothesis six**

The null hypothesis states that there is no significant difference in the remedial strategies to Global Warming its effects in Akwa Ibom and Enugu States. In order to test the hypothesis, independent t-test analysis was used to analyze the data (see table 6).

**TABLE 6**

Independent t-test analysis of the difference in the remedial strategies to Global warming its effects in Akwa Ibom and Enugu States.

N = 180

Variable	N	$\bar{X}$	SD	t
AKWA IBOM	90	17.70	1.56	10.67*
ENUGU	90	15.60	1.03	

**\*Significant at 0.05 level; df = 178; N= 180; critical t-value 1.984**

Table 6 presents the obtained t-test-value (10.67). This value was tested for significance by comparing it with the critical t-value (1.984). at 0.05 level with 178 degree of freedom. The obtained t-value (10.67) was greater than the critical t-value (1.984). Hence, the result was significant. The result therefore means that there is significant difference in the remedial strategies to Global Warming its effects in Akwa Ibom and Enugu States. This result is in support of the findings of Saj (2021) who stated that Global warming, primarily driven by anthropogenic greenhouse gas (GHG) emissions, poses severe threats to ecosystems, human health, food security, and global economies. The significance of the result caused the null hypothesis to be rejected while the alternative hypothesis was upheld.

## **CONCLUSION**

In conclusion, the assessment of global warming's impacts on human health in Akwa Ibom and Enugu states shows that climate change is already exacerbating heat-related illnesses, vector- and water-borne diseases, food insecurity and mental-health stressors, with coastal Akwa Ibom facing heightened flooding and vector proliferation while Enugu's urban heat islands and changing rainfall patterns intensify respiratory, diarrhea and malnutrition risks. Dependable controls require a combination of mitigation (reducing greenhouse-gas emissions through clean-energy adoption, sustainable transportation, and curtailed biomass burning) and targeted adaptation (heat-health action plans, climate-resilient water and sanitation systems, improved drainage and flood management in Akwa Ibom, urban greening and building design in Enugu). Strengthening public health systems—early warning and disease surveillance, integrated vector control, community health education, and surge capacity for heat waves and outbreaks—will reduce morbidity and mortality. Cross-sectoral policies that link health, environment, agriculture and urban planning, backed by local data, community participation and sustained funding, are vital to translate strategies into outcomes. Finally, continuous monitoring, localized research, and inclusive stakeholder engagement (state governments, traditional leaders, NGOs, and communities) will ensure interventions remain evidence-based, equitable and adaptive – paving the way for a healthier, climate-resilient human environment in both states.

## **RECOMMENDATIONS**

1. Both states should establish reliable climate-health monitoring systems that track temperature changes, flooding patterns, air quality, and the incidence of climate-sensitive diseases. Early warning systems for heat waves, malaria, cholera, and respiratory infections will enable timely interventions.
2. Government and urban planners should implement climate-smart infrastructure. In Akwa Ibom, improved flood-control systems and coastal protection are vital, while in Enugu, urban greening, sustainable housing designs, and efficient drainage networks will mitigate heat island effects and heavy rainfall impacts.
3. To reduce greenhouse-gas emissions, both states should transition towards solar, wind, and hydropower while discouraging biomass burning, excessive fossil fuel use, and deforestation. Rural electrification using clean energy will reduce indoor air pollution and its associated respiratory diseases.
4. Strengthening health facilities to handle climate-induced health burdens is essential. This includes training health workers on climate-sensitive diseases, improving hospital cooling and water systems, and integrating climate-health response into public health programs.
5. Awareness campaigns should be carried out at community and school levels to educate residents on the dangers of global warming, proper waste disposal, water conservation, afforestation, and household-level preventive measures against vector- and water-borne diseases.
6. Climate-smart farming techniques, such as irrigation management, drought-resistant crops, and organic soil improvement, should be encouraged. This will reduce hunger, malnutrition, and economic stress resulting from climate impacts on agriculture in both states.

**DECLARATION OF COMPETING INTEREST**

The author declares that he has no competing financial interests or personal relationship that could have appeared to influence the work reported in this paper.

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