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Assessment of Climate Change Variability and the Ethics of Land Use in Southeast Nigeria

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ABSTRACT

Climate change has become one of the most pressing environmental issues impacting land use practices and sustainable development in Southeast Nigeria. This research explored the connections between climate change and land use ethics in the region, focusing on the environmental, socio-economic, and moral consequences of exploiting land unsustainably. The study identified key factors driving climate change, evaluated its effects on livelihoods and environmental sustainability, and investigated ethical and sustainable strategies for managing climate-related obstacles. A descriptive survey research design was employed, gathering data from 250 participants selected through purposive and simple random sampling methods across various states in Southeast Nigeria. Data collection involved questionnaires, interviews, and secondary sources such as academic journals, textbooks, and government documents. Data analysis utilized frequency tables and percentage distributions. The findings indicated that activities like deforestation, urban expansion, industrial development, bush burning, poor farming practices, and increasing population pressures have substantially contributed to climate change and environmental degradation in the region. Furthermore, the research showed that climate change has adversely impacted agricultural output, food security, biodiversity, water resources, and rural livelihoods. Ethical issues such as land grabbing, unequal resource allocation, and a lack of respect for indigenous ecological knowledge emerged as significant challenges. The study concluded that adopting sustainable land management practices, enhancing environmental education, promoting afforestation, enforcing relevant policies, and encouraging community involvement are essential for fostering environmental sustainability and ethical land use in Southeast Nigeria. Recommendations included strengthening environmental regulations, raising public awareness, and incorporating indigenous knowledge into climate change mitigation strategies.

Keywords: *Climate change, land use ethics, environmental sustainability, Southeast Nigeria, sustainable development, environmental degradation.*

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Introduction

Climate change has become one of the biggest environmental problems facing humanity in the twenty-first century. It refers to long-term changes in temperature, rainfall patterns, wind systems, and other climate conditions mainly caused by human activities like deforestation, industrialization, urbanization, and the high emission of greenhouse gases (Intergovernmental Panel on Climate Change [IPCC], [1]. Worldwide, climate change has affected agricultural productivity, biodiversity, water resources, human health, and economic development. In developing countries like Nigeria, the effects of climate change are increasingly visible through rising temperatures, erratic rainfall patterns, flooding, soil erosion, desertification, and decreasing agricultural output [2].

Southeast Nigeria, which includes states like Abia, Anambra, Ebonyi, Enugu, and Imo, has seen significant environmental damage related to climate change and unhealthy land use. The area relies heavily on land for agriculture, housing, industry, and infrastructure. However, factors such as rapid population growth, deforestation, bush burning, urban expansion, sand mining, and reckless use of natural resources have worsened ecological issues in the region [3,4]. These activities have led to soil erosion, flooding, loss of plant life, reduction of soil fertility, and disruption of local ecosystems.

The ethical aspect of land use has become an important topic in scholarly discussions because land is vital for human survival, cultural identity, and economic growth.

Environmental ethics focuses on responsible interaction between people and the natural environment, calling for sustainable use of land for current and future generations [5]. In Southeast Nigeria, ethical worries emerge from harmful land use practices that favor short-term economic gain over environmental sustainability. Actions like reckless logging, poor waste disposal, over-farming, and unchecked urbanization have increased climate-related risks in the region.Climate change has made socio-economic problems in Southeast Nigeria worse. Farmers face unpredictable planting seasons, crop failures, falling yields, and loss of income due to erratic rainfall and severe weather conditions. Flooding and gully erosion have forced communities to relocate, ruined farmland, and damaged infrastructure across multiple states in the region[6]. These environmental issues raise serious ethical questions about environmental justice, fairness for future generations, and the responsibility of governments, communities, and individuals to protect land resources.

Moreover, the idea of sustainable land use has become more important as a way to lessen the effects of climate change and ensure environmental health. Sustainable land use means managing and using land resources carefully to maintain ecological balance while meeting human needs (United Nations Environment Programme [UNEP], [7]. Ethical land use practices like planting trees, conserving soil, using climate-friendly farming techniques, and implementing sound environmental management policies are increasingly seen as essential for tackling climate change in vulnerable areas like Southeast Nigeria. Despite growing awareness about climate change, many communities in Southeast Nigeria still engage in harmful land use practices due to poverty, lack of environmental education, weak policy enforcement, and limited access to sustainable options. Therefore, there is a need for a detailed assessment of climate change and land use ethics in the region. Such research would help understand the link between human land use and climate change impacts while promoting ethical and sustainable environmental practices.

Climate change has become a significant challenge for the environment and development in Southeast Nigeria. The region faces increasing flooding, gully erosion, irregular rainfall patterns, rising temperatures, and declining agricultural productivity. These issues harm livelihoods, food security, infrastructure, and ecological health. Despite the worsening situation, unsustainable land use practices, such as deforestation, uncontrolled bush burning, excessive urbanization, sand mining, and poor agricultural methods, continue in the area.The irresponsible use of land has greatly contributed to environmental damage and has made communities more vulnerable to the impacts of climate change. Many people and organizations prioritize making money over protecting the environment, which undermines sustainable land management. Additionally, weak enforcement of environmental policies, low public awareness, and poor implementation of regulations have further intensified ecological issues in Southeast Nigeria. While several studies have looked into climate change and environmental degradation in Nigeria, few have explored the ethical aspects of land use practices and their link to climate change in Southeast Nigeria. Most current research mainly focuses on scientific or economic views without fully addressing moral responsibility, environmental justice, and sustainable land ethics. This knowledge gap calls for an evaluation of climate change and land use ethics in Southeast Nigeria to encourage better environmental management and policy development.

The general objective of this study is to examine climate change variability and the ethics of land use in Southeast Nigeria. The specific objectives are to: a). examine the major causes of climate change variability and unethical land use practices causing climate change in Southeast Nigeria; b). assess the ethical implications of current land use practices in the region; c). Identify the major drivers of unsustainable land use in Southeast Nigeria; d). evaluate the impact of climate change on livelihoods and environmental sustainability. Suggest ethical and sustainable land use strategies for mitigating climate change effects. This research holds importance as it adds to the ongoing conversation about climate change, environmental sustainability, and ethical stewardship within Nigeria and across Africa. With climate change posing a significant threat to both human existence and ecological integrity, it is crucial to advocate for ethical practices in land use and environmental management. This study sheds light on the ways in which human actions lead to environmental degradation and heightened vulnerability to climate issues in Southeast Nigeria. Moreover, the relevance of this study is underscored by the fact that Southeast Nigeria is among the regions most severely impacted by environmental challenges like erosion, flooding, and deforestation. Grasping the ethical aspects of these issues can empower policymakers, environmental organizations, and local communities to devise more effective land-use policies and climate adaptation measures. The insights gained from this research may motivate greater accountability for environmental practices and responsible resource management.

From an academic standpoint, this work enriches fields such as environmental philosophy, ethics, geography, and climate studies by merging philosophical insights with tangible environmental concerns. It enhances existing literature regarding environmental ethics and sustainable development, specifically within the African framework. Additionally, the study may act as a valuable resource for students, researchers, and academics who are focused on climate change, environmental ethics, and land management. Furthermore, this research highlights the significance of indigenous environmental beliefs and communal strategies for conservation. By advocating for ethical stewardship of land resources, the study promotes a sense of responsibility that spans generations and supports sustainable development. Ultimately, this work aims to strike a balance between human progress and environmental preservation in Southeast Nigeria.

Methodology

The research took place in Southeast Nigeria, encompassing five states: Abia, Anambra, Ebonyi, Enugu, and Imo. This region was chosen due to the rising environmental issues linked to climate change and unsustainable land use, manifesting in forms such as flooding, gully erosion, deforestation, and reduced agricultural output. Nestled within Nigeria's tropical rainforest belt, Southeast Nigeria is marked by heavy rainfall, high humidity, and fertile land ideal for agriculture [1]. The primary occupations of the local populace included farming, trading, and civil service, with agriculture being a key economic driver, thus making residents heavily reliant on land resources for their livelihoods [8]. Additionally, the region faced rapid urban growth and population increase, intensifying pressure on land resources and contributing to environmental degradation. A descriptive survey research design was utilized in this study to explore climate change and land use ethics in Southeast Nigeria.

This design was deemed suitable for gathering extensive insights from respondents concerning their perceptions, experiences, and ethical dilemmas regarding land use practices and the impacts of climate change in the area. Creswell and Creswell [9] highlight that survey research is effective for collecting data from a broad population to describe attitudes, opinions, and trends. By integrating both quantitative and qualitative methodologies, the study aimed to provide a thorough understanding of the interplay between climate change and land use ethics in this region. It concentrated on critical issues like deforestation, urban development, soil degradation, agricultural expansion, erosion, and ethical aspects of land ownership and environmental sustainability. The mixed-methods approach facilitated the acquisition of numerical data through questionnaires as well as qualitative insights via interviews and observations [10]. The study's population included farmers, environmental officials, community leaders, landowners, academics, and residents from selected communities throughout Southeast Nigeria, estimated at 2,500 individuals across the five states. This group was deemed appropriate, as they possessed significant knowledge and experience concerning land use practices and climate change challenges in their communities. A multistage sampling technique was employed for respondent selection. Initially, purposive sampling identified the five states due to their existing climate-related environmental issues. Subsequently, simple random sampling was utilized to select communities within each state. Stratified sampling techniques were utilized to classify respondents into distinct groups: farmers, environmental officials, landowners, and community leaders, ensuring that each relevant segment was adequately represented. This approach contributed to greater fairness and minimized bias in the selection process. The selection of participants was done proportionally across different states to maintain balanced representation [11]. A total sample size of 250 respondents, reflecting 10% of the overall population, was chosen for the study. Data collection involved both primary and secondary sources. Primary data were gathered through structured questionnaires, oral interviews, and field observations. The questionnaire included both closed-ended and open-ended questions aimed at capturing insights on experiences related to climate change, land use practices, ethical viewpoints, and environmental sustainability. For data analysis, descriptive statistical tools such as frequency counts, percentages, and tables were employed.

Results and Discussions

Major Causes of Climate Change Variability in Southeast Nigeria

Table 1 showed that deforestation and uncontrolled logging were seen as the main causes of climate change variability in Southeast Nigeria. Out of 210 respondents, 84.0% highlighted this issue. This indicated that the ongoing loss of forest cover had greatly reduced the ability to store carbon and contributed to rising temperatures. Recent studies noted that forest degradation and changes in land use had increased environmental instability and climate variation in Southern Nigeria [12].Gas flaring and oil exploration ranked second, with 198 responses accounting for 79.2%. Respondents viewed oil-related pollution as a significant source of greenhouse gas emissions in the area, especially in the Niger Delta region near Southeast Nigeria. Literature showed that gas flaring emits carbon dioxide, methane, and other pollutants that worsen global warming and atmospheric instability [13].

Urbanization and infrastructure development received 185 responses, representing 74.0%. This suggested that rapid urban growth, road building, and converting natural land to developed areas had changed local climate patterns. Researchers pointed out that urbanization leads to heat islands, increased flooding, and shifts in rainfall across Nigerian cities [14].Bush burning and forest fires accounted for 176 responses or 70.4%. This indicated that the common practice of clearing farmland by burning significantly added to carbon emissions and environmental harm. Existing studies maintained that bush burning destroys biodiversity and releases large amounts of greenhouse gases into the air. Industrial emissions and air pollution received 170 responses, representing 68.0%. Respondents felt that smoke and gas from industries were major contributors to air pollution and rising temperatures. Research has consistently linked industrial pollution with climate change and poor environmental quality in Nigeria [15].Unsustainable farming practices got 166 responses, accounting for 66.4%. This implied that overuse of chemical fertilizers, excessive farming, and slash-and-burn techniques were adding to climate variability. Studies showed that these farming methods speed up soil degradation and greenhouse gas emissions. Population growth and pressure on land resources garnered 160 responses, representing 64.0%. This showed that a growing population intensified the strain on forests, agricultural lands, and natural ecosystems. Literature confirmed that demographic growth increases resource use and environmental stress, worsening climate change. Poor waste disposal and open burning of trash accounted for 154 responses, or 61.6%. Respondents pointed out that careless dumping and burning of waste released harmful gases into the atmosphere. Recent studies have found that poor waste management significantly adds to methane and carbon emissions in cities [16].Fossil fuel combustion from vehicles and generators received 149 responses, representing 59.6%. This suggested that emissions from transportation and frequent use of generators due to unstable electricity supply contributed to the buildup of greenhouse gases. Researchers identified fossil fuel combustion as one of the main factors driving global and regional climate change [16].Finally, sand mining, quarrying, and land degradation had 141 responses, accounting for 56.4%. This indicated that these extractive activities changed land surfaces, destroyed vegetation, and increased environmental vulnerability. Studies on environmental degradation in Southeast Nigeria connected mining activities to erosion, flooding, and ecological imbalance [12].

Table 1: Major Causes of Climate Change Variability in Southeast Nigeria

S/N	Major Causes of Climate Change Variability	Frequency	Percentage
1	Deforestation and indiscriminate logging	210	84.0
2	Gas flaring and oil exploration activities	198	79.2
3	Urbanization and infrastructural expansion	185	74.0
4	Bush burning and forest fires	176	70.4
5	Industrial emissions and air pollution	170	68.0
6	Unsustainable agricultural practices	166	66.4
7	Population growth and pressure on land resources	160	64.0
8	Poor waste disposal and open waste burning	154	61.6
9	Fossil fuel combustion from vehicles and generators	149	59.6
10	Sand mining, quarrying, and land degradation	141	56.4

Unethical Land Use Practices Contributing to Environmental Degradation in the Region

A look at table 2 showed what people think about harmful ways land is used in Southeast Nigeria. Most answers pointed to factories polluting and oil spills as top concerns - 223 people, which is nearly nine out of ten, saw these as major issues.

Damage from factory waste, oil drilling, and leaked crude appears to have deeply harmed soil health, water sources, plant life, and local wildlife across the area. Second place went to cutting down trees without care, named by 214 people - wait, actually 221 - as a key force behind nature's decline. That's 88.4 percent, seeing forests vanish faster than new ones grow. Soil washes away more now. Animals lose homes. Weather patterns shift unevenly across regions. Tossing trash wherever, especially into rivers and open ground, came up almost just as much: 214 voices raised it, which is 85.6 percent. Rotting piles on land, plastic choking streams - it paints a picture of neglected spaces harming both living things and human well-being. The link between dirty habits and damaged surroundings feels harder to ignore. Fire used on farms and wild areas came up in answers from 205 people, equaling 82 percent. That habit, kept up over time for clearing ground or chasing animals, has worn down the earth, filled the air with smoke, harmed plant variety. Two hundred one individuals noted poor crop methods and tired soil - about four out of five. Growing food nonstop, without protecting dirt health, pushed damage to the fields, slowed harvests later on. Out of everyone asked, 192 people - about three-quarters - pointed to cities spreading without rules along with land taken unlawfully. These actions tie directly to forests vanishing, wildlife areas being torn up, and land getting stretched too thin. Nearly the same number, 187 individuals, brought up illegal digging for sand and earth removal. Such practices are tearing into river edges, reshaping terrain, and weakening ground structure over time. Seventeen people out of every twenty-five pointed to heavy chemical fertilizer and pesticide use. That kind of farming has been messing up soil quality, tainting water sources, while harming local wildlife too. Nearly seventeen in every twenty-five also flagged the taking over of wetlands and flood zones. When those sensitive areas get disturbed by people, floods tend to hit harder and nature's own defenses start fading away. One hundred and fifty-four people pointed to heavy grazing along with loss of plant cover. That comes out to sixty one point six percent. It showed up last on the list of causes named. Even so, it carried weight as a serious issue. Thick grass disappearing ties back to worn out ground across areas in southeast Nigeria. Land stripped bare struggles to hold soil when animals feed too long. What emerged clearly was how harmful ways of using land have deeply damaged nature across Southeast Nigeria. Because of what people reported, stronger rules now seem essential - alongside smarter approaches to managing soil and forests, teaching locals about ecosystems, getting villages involved in protecting their surroundings - all aimed at slowing down ongoing environmental harm.

What the research uncovered lines up closely with earlier reports about harmful land habits and worsening nature damage across Southeast Nigeria, along with similar zones nationwide. Industrial waste stood out clearly in answers - oil leaks especially - which fits what the United Nations Environment Programme found years ago: drilling and constant spills wrecked the earth quality, tainted drinking sources, ruined crop areas, plus wiped out many living species. Back then, [7,17] noted how ongoing crude contamination battered daily survival methods, natural systems, and long-term ecological balance down south.That discovery about trees being cut down without care matches what the UN food and farm group reported. Their reports show reckless timber harvesting has made deserts spread faster, soil wash away, species vanish - especially in poorer nations like Nigeria.

Just as clearly, a study by [4,18] done in (2015) showed how chopping forests in southeast Nigeria opened up the ground, letting deep cracks form and weakening the earth beneath. Without leaves holding things together, everything started slipping apart. On improper throwing of refuse, [19], noticed that in cities and villages where garbage just piles up, hat mess, he wrote, seeps into soil and rivers across Nigeria. When trash isn't handled right, danger grows quietly. Health suffers over time because of it.

Back in 2016, [20]looked at how setting fires to clear brush affects the land - turns out it wipes out key nutrients in the soil. Their work matches what was seen here: when fields are burned every season, the natural order of plants and animals gets thrown off. Because of these regular blazes, topsoil washes away more easily during rains, leaving behind ground that grows less food. Over time, farmers struggle because each burn strips a bit more from the earth's ability to support crops. From time to time, certain ways of growing food push the land too hard, a point that lines up with what [21] opined that working soil nonstop, without protecting it, drains its strength and weakens the ground. Over in Nigeria, findings from [22] showed methods like moving farms often, turning the earth too much, or planting just one crop led to serious loss of topsoil and smaller harvests across the southeast. Wetlands vanishing, floods rising - that pattern shows up again in fast-growing cities without rules. [23] noticed how unchecked building chewed through natural spaces in the Southeast. Instead of guiding growth, local plans often fail to act. Because of this gap, damage piles up where people live. Nature pays a price when decisions ignore limits.Out in the open, people worried about rogue digging for sand, much like what [24], said shifts in terrain weren't gentle - whole stretches of land began to slip when sand was taken without care. Water life suffered too, pulled apart by the weight of unchecked removals. Along river edges down south in Nigeria, erosion picked up speed where it once crept slowly. From their look at things, the writers called out how greed-driven digging puts long-term balance at risk. Heavy fertilizer and pesticide use matches what the World Health Organization reported - soil and water pollution follow, along with harm to people and nature. Not far off, [25] pointed out how relying too much on chemicals weakens soil life and cuts down variety in crops over time.Wetland loss and damage to floodplains match what [26], observed that people moving into wet areas down south in Nigeria made floods more likely, worsened shore breakdown, harmed natural systems. These places do far more than most realize when it comes to shielding the environment and balancing weather shifts. Surprisingly, the results tied to overgrazing matched what [27] in their research showed unchecked livestock movement pressed down soil, stripped green cover, damaged farmland across villages. From their view, weak oversight of fields kept pushing ecosystems into worse shape throughout Nigeria.

Table 2: Unethical Land Use Practices Contributing to Environmental Degradation in Southeast Nigeria

Unethical Land Use Practices	Frequency	Percentage
Deforestation and indiscriminate logging	221	88.4
Bush burning and uncontrolled burning of vegetation	205	82.0
Illegal sand mining and excavation activities	187	74.8
Improper waste disposal on land and waterways	214	85.6
Excessive use of chemical fertilizers and pesticides	176	70.4
Encroachment on wetlands and floodplains	168	67.2
Unregulated urban expansion and land grabbing	192	76.8
Overgrazing and destruction of vegetation cover	154	61.6
Unsustainable farming practices and soil overuse	201	80.4
Industrial pollution and oil spillage on land	223	89.2

Ethical Implications of Current Land Use Practices in Southeast, Nigeria

Table 3 below summarizes how 250 respondents evaluated the ethical dimensions of current land use practices in Southeast Nigeria, based on multiple responses. A significant majority agreed that prevailing land use methods carry substantial ethical, environmental, and socio-economic impacts. The strongest consensus was observed for the statement that existing land use practices lead to environmental degradation and biodiversity loss, with 223 respondents (89.2%) in agreement. This highlights a widespread perception that deforestation, habitat destruction, and the decline of natural ecosystems are serious ethical issues tied to land management in the region. A nearly equal proportion—220 respondents (88.0%)—acknowledged that soil erosion and land degradation resulting from poor land use practices negatively affect agricultural output. This reflects broad concern about deteriorating soil quality, severe gully erosion, and declining food production, pointing to the ethical implications of land misuse for food security and long-term farming viability. Further, 216 respondents (86.4%) agreed that inadequate land management contributes to climate change and ecological disruption. This indicates recognition among respondents of the link between unsustainable land practices, rising greenhouse gas emissions, altered rainfall patterns, flooding, and other climate-related risks affecting local populations. Additionally, 214 respondents (85.6%) stated that deforestation and unregulated land clearing contradict principles of environmental sustainability. Respondents view activities such as unchecked logging, bush burning, and forest clearance as ethically questionable due to their damaging effects on ecological balance and conservation efforts. Concerns extend to rural livelihoods, as 205 respondents (82.0%) agreed that unsustainable land use undermines the economic well-being of rural communities. The degradation of arable land limits farming opportunities, exacerbates poverty, and weakens the resilience of households dependent on agriculture. A notable 201 respondents (80.4%) also believe that current practices jeopardize future generations' access to natural resources. This reflects an awareness of intergenerational equity and the moral obligation to conserve environmental assets for long-term use. Moreover, 198 respondents (79.2%) identified land grabbing and unequal land allocation as violations of social justice. The concentration of land control in the hands of powerful individuals or institutions is seen as ethically and socially unjust. The data also showed that 193 respondents (77.2%) attribute unethical land exploitation to weak enforcement of environmental regulations. Inadequate oversight and corruption are viewed as enabling environmental harm and unsustainable practices. Urbanization and industrial growth were cited by 187 respondents (74.8%) as factors displacing indigenous and local communities. This raises concerns over forced relocation, loss of ancestral lands, and the erosion of traditional lifestyles due to rapid development. Finally, 182 respondents (72.8%) noted that local communities are frequently excluded from decisions about land use, contributing to social tensions. The lack of inclusive governance is seen as a driver of conflict, mistrust, and community discord. The results reveal a strong perception among respondents that current land use practices in Southeast Nigeria raise serious ethical concerns due to their adverse effects on the environment, climate, social equity, agriculture, and community stability. The findings underscore the importance of ethical land administration, improved environmental regulation, sustainable land use strategies, and more inclusive decision-making processes.

Table 3: Ethical Implications of Current Land Use Practices in Southeast Nigeria

	Ethical Implications Statements	Frequency	Percentage
1	Current land use practices contribute to environmental degradation and loss of biodiversity	223	89.2
2	Deforestation and indiscriminate land clearing violate principles of environmental sustainability	214	85.6
3	Unsustainable land use practices negatively affect the livelihoods of rural communities	205	82.0
4	Land grabbing and unequal land distribution undermine social justice and equity	198	79.2
5	Poor land management practices contribute to climate change and ecological imbalance	216	86.4
6	Current land use practices threaten the rights of future generations to access natural resources	201	80.4
7	Urban expansion and industrial activities displace indigenous and local communities	187	74.8
8	Soil erosion and land degradation caused by poor land use practices reduce agricultural productivity	220	88.0
9	Weak enforcement of environmental laws encourages unethical exploitation of land resources	193	77.2
10	Community participation in land use decision-making is often ignored, leading to social conflict	182	72.8

Major Drivers of Unsustainable Land Use in Southeast Nigeria

Table 4 shows how respondents identified the main causes of unsustainable land use in Southeast Nigeria based on multiple responses from 250 people. The results reveal that respondents pointed out various social, economic, political, environmental, and institutional factors causing unsustainable land use practices in the region. The highest number of responses came from the statement that deforestation for agriculture and fuelwood is a major cause of unsustainable land use. This was noted by 228 respondents, or 91.2%. This indicates that cutting down trees, clearing forests, and relying on wood for domestic energy significantly harm the environment and reduce biodiversity in Southeast Nigeria. Similarly, 223 respondents, making up 89.2%, agreed that poor agricultural practices like bush burning and shifting cultivation contribute to land degradation. This suggests that traditional farming methods that are not sustainable are significant factors speeding up soil infertility, erosion, and loss of vegetation.

The table also shows that 221 respondents, or 88.4%, agreed that rapid population growth adds pressure on available land resources. This means the growing population density in the region has intensified competition for land needed for housing, farming, and businesses, leading to overuse of land resources. Additionally, 216 respondents, which is 86.4%, identified urbanization and the expansion of settlements as a major cause of unchecked land conversion. This means that fast urban growth and infrastructure development are causing the loss of farmland, forests, and wetlands. Furthermore, 214 respondents, or 85.6%, agreed that weak enforcement of environmental and land use laws promotes land degradation. This implies that the poor enforcement of environmental regulations, ineffective monitoring, and lack of accountability significantly contribute to unsustainable land use. The findings also show that 211 respondents, or 84.4%, agreed that corruption and poor governance lead to unfair land allocation and misuse. This indicates that abuse of power, favoritism, and inadequate management are major barriers to sustainable land governance

in the area. Moreover, 209 respondents, representing 83.6%, agreed that poverty and unemployment lead to overexploitation of land resources. This reflects the situation where economically disadvantaged people often depend heavily on land and natural resources for survival, resulting in unsustainable practices. The table also shows that 205 respondents, or 82.0%, agreed that climate change and extreme weather worsen land degradation. This means that environmental issues like flooding, drought, and irregular rainfall patterns further increase the vulnerability of land resources in Southeast Nigeria. Additionally, 201 respondents, or 80.4%, agreed that mining and quarrying activities speed up soil erosion and environmental damage. This suggests that these activities lead to landscape destruction, pollution, and ecological imbalance. The results further indicate that 197 respondents, or 78.8%, agreed that industrialization and infrastructure development cause environmental harm. This implies construction projects, industrial growth, and road expansion often happen without enough environmental consideration. Similarly, 193 respondents, or 77.2%, agreed that a lack of environmental education and public awareness leads to poor land management. This suggests that limited knowledge about sustainable practices hinders responsible land use among individuals and communities. Finally, 189 respondents, or 75.6%, agreed that land grabbing by powerful individuals and organizations contributes to unequal and unsustainable land use. This indicates concerns over unfair land acquisition practices that deny local communities access to land and increase social inequality. The findings highlight that unsustainable land use in Southeast Nigeria is driven by a mix of environmental, social, economic, demographic, and governance factors. The results underline the urgent need for effective environmental policies, sustainable agricultural methods, stronger enforcement of regulations, poverty reduction initiatives, public education on the environment, and ethical land governance to promote sustainable land use in the region[28,29,30].

Rapid population growth in Southeast Nigeria has significantly strained available land resources. Participants noted that the rising demand for housing, roads, and commercial spaces has led to severe deforestation, fragmentation of land, and the conversion of agricultural areas into urban settlements. They pointed out that communal lands previously reserved for farming and conservation have gradually diminished due to urban sprawl. Moreover, poverty and unemployment were highlighted by several respondents as key factors driving unsustainable land use, with many rural communities relying on forests and farmlands for survival, which led to practices like bush burning and illegal logging. The lack of alternative livelihoods has compelled locals to exploit land resources beyond sustainable limits. Additionally, participants expressed concerns over weak government policies and inadequate enforcement of environmental regulations, resulting in unchecked land acquisition and deforestation. Urbanization and industrialization were also cited as significant contributors to land misuse, with ongoing construction activities reducing green spaces. Furthermore, climate change impacts such as flooding, erosion, and rising temperatures have diminished soil fertility, pushing communities to seek new lands for farming. Many participants observed a decline in traditional land ethics and indigenous conservation practices, as modernization and changing cultural attitudes shifted priorities toward personal economic gain over environmental sustainability. Lastly, poor agricultural methods, like continuous cropping and excessive chemical use, have further accelerated soil degradation, prompting farmers to clear more forests for cultivation.

Table 4: Major Drivers of Unsustainable Land Use in Southeast Nigeria

	Major Drivers of Unsustainable Land Use	Frequency	Percentage
1	Rapid population growth increases pressure on available land resources	221	88.4
2	Urbanization and expansion of settlements contribute to indiscriminate land conversion	216	86.4
3	Deforestation for agriculture and fuelwood is a major cause of unsustainable land use	228	91.2
4	Poverty and unemployment encourage overexploitation of land resources	209	83.6
5	Weak enforcement of environmental and land use regulations promotes land degradation	214	85.6
6	Poor agricultural practices such as bush burning and shifting cultivation contribute to land degradation	223	89.2
7	Industrialization and infrastructural development lead to environmental destruction	197	78.8
8	Land grabbing by powerful individuals and organizations contributes to unequal and unsustainable land use	189	75.6
9	Mining and quarrying activities accelerate soil erosion and environmental degradation	201	80.4
10	Climate change and extreme weather conditions worsen land degradation	205	82.0
11	Lack of environmental education and public awareness contributes to poor land management	193	77.2
12	Corruption and poor governance encourage unethical land allocation and misuse	211	84.4

Impact of climate change on livelihoods and environmental sustainability in Southeast Nigeria

Table 5 shows how respondents evaluated the impact of climate change on livelihoods and environmental sustainability in Southeast Nigeria, based on multiple responses from 250 participants. The findings revealed that climate change significantly harmed agricultural activities, environmental sustainability, economic well-being, and the overall livelihood of rural communities. The largest response came from the statement that increased flooding and erosion destroyed farmlands, homes, and infrastructure. This was supported by 229 respondents, or 91.6%. This result indicated that respondents viewed flooding and erosion as the most apparent and damaging effects of climate change in the area. The research suggested that climate-related disasters severely damaged agricultural lands, residential areas, and public facilities.

Similarly, 224 respondents, representing 89.6%, agreed that climate change reduced agricultural productivity and food security in rural areas. This implied that shifting weather patterns negatively impacted crop production, lowered harvest yields, and increased the risk of food shortages in rural households. The table also showed that 221 respondents, or 88.4%, agreed that irregular rainfall patterns hurt farming efforts and crop yields. This suggested that unpredictable rainfall disrupted planting and harvesting seasons, undermining agricultural efficiency and jeopardizing farmers' livelihoods. Additionally, 218 respondents, representing 87.2%, agreed that persistent land degradation and ecosystem destruction threatened environmental sustainability. This finding indicated that climate change worsened environmental issues like soil erosion, deforestation, loss of vegetation, and ecological imbalance.

Furthermore, 215 respondents, or 86.0%, agreed that extreme weather conditions harmed public health and overall well-being. This implied that excessive heat, flooding, and other climate-related risks increased disease prevalence, reduced living standards, and negatively impacted the welfare of affected communities. The results also showed that 212 respondents, or 84.8%, agreed that rising temperatures led to loss of biodiversity and environmental damage. This suggested that higher temperatures disrupted ecosystems, endangered plant and animal species, and sped up environmental decline. Moreover, 206 respondents, representing 82.4%, agreed that climate change heightened poverty and economic struggles among rural families. This finding indicated that lower agricultural productivity, property damage, and limited access to resources weakened household incomes and increased economic vulnerability. The table indicated that 203 respondents, or 81.2%, agreed that climate change reduced the availability of natural resources used for livelihoods. This implied that resources like fertile land, forests, and water bodies became scarcer due to environmental degradation and changing weather patterns.

Additionally, 198 respondents, or 79.2%, agreed that water scarcity and drying streams impacted domestic and agricultural activities. This suggested that declining water resources made irrigation, household use, and livestock management more difficult. Finally, 191 respondents, or 76.4%, agreed that climate change led to more migration and displacement among rural populations. This indicated that environmental degradation, loss of livelihoods, and climate-related disasters pushed some individuals and families to relocate in search of safer living conditions and better economic opportunities. Overall, the findings showed that climate change had devastating effects on livelihoods and environmental sustainability in Southeast Nigeria. The results highlighted that climate-related challenges adversely impacted agriculture, food security, public health, natural resources, and economic stability. The findings emphasize the need for effective strategies to cope with climate change, conserve the environment, practice sustainable land management, and improve disaster response systems in the region [28,29,30].

Table 5: Impact of Climate Change on Livelihoods and Environmental Sustainability

	Climate Change on Livelihoods and Environmental Sustainability	Frequency	Percentage
1	Climate change reduced agricultural productivity and food security in rural communities	224	89.6
2	Increased flooding and erosion destroyed farmlands, homes, and infrastructure	229	91.6
3	Irregular rainfall patterns negatively affected farming activities and crop yields	221	88.4
4	Rising temperatures contributed to loss of biodiversity and environmental degradation	212	84.8
5	Climate change increased poverty and economic hardship among rural households	206	82.4
6	Water scarcity and drying of streams affected domestic and agricultural activities	198	79.2
7	Climate change contributed to increased migration and displacement of rural populations	191	76.4
8	Extreme weather conditions negatively affected public health and human well-being	215	86.0
9	Climate change reduced the availability of natural resources used for livelihoods	203	81.2
10	Environmental sustainability was threatened by persistent land degradation and ecosystem destruction	218	87.2

Ethical and Sustainable Land Use Strategies for Mitigating Climate Change Effects

Table 6 shows the suggestions from 250 respondents about ethical and sustainable land use strategies to address climate change in Southeast Nigeria. The results indicate that respondents strongly favored various environmental, institutional, and community-based strategies to reduce the negative effects of climate change and promote sustainable land management. The most support came for the idea that afforestation and reforestation programs should be encouraged to restore degraded lands. This was backed by 231 respondents, or 92.4%. This shows a strong belief in the importance of planting trees and restoring forest cover as key strategies for controlling erosion, improving biodiversity, and lessening the impact of climate change in the region. Similarly, 225 respondents, representing 90.0%, agreed that sustainable agricultural practices, such as crop rotation and organic farming, should be promoted. This suggests that respondents recognize the value of eco-friendly farming methods in protecting soil fertility, boosting agricultural productivity, and reducing environmental harm. The table also shows that 223 respondents, or 89.2%, agreed that soil conservation measures should be adopted to lower erosion and land degradation. This implies that respondents see erosion control techniques, proper land management, and soil preservation practices as vital for environmental sustainability. Additionally, 221 respondents, making up 88.4%, agreed that climate change adaptation and disaster management programs should be strengthened. This indicates that respondents believe in the need for preparedness, building resilience, and having effective measures in place to respond to climate-related hazards.

Furthermore, 219 respondents, or 87.6%, agreed that the government should strengthen enforcement of environmental and land use regulations. This suggests that respondents think implementing environmental laws and policies effectively will help reduce unethical land use and encourage sustainable practices. The findings also revealed that 216 respondents, or 86.4%, agreed that land use planning and urban development should prioritize sustainability. This implies that proper urban planning and environmentally friendly development strategies are necessary to prevent reckless land conversion and environmental damage. Moreover, 213 respondents, or 85.2%, agreed that environmental education and public awareness campaigns should be increased. This suggests that respondents see public education and awareness as key to promoting responsible land use and protecting the environment. The table also showed that 207 respondents, or 82.8%, agreed that promoting alternative energy sources can help reduce reliance on fuelwood. This indicates that respondents believe that cleaner energy options would lessen deforestation and environmental degradation linked to heavy fuelwood use. Additionally, 204 respondents, representing 81.6%, agreed that community involvement in land use decisions should be encouraged. This indicates that respondents value inclusive governance and believe that engaging local communities in land decisions can promote fairness, reduce conflicts, and enhance environmental management. Lastly, 198 respondents, or 79.2%, agreed that policies for fair land distribution and social justice should be put in place. This suggests that respondents view equitable access to land and fairness in land allocation as important for reducing social inequality and supporting responsible land governance.

The findings show that respondents strongly support ethical and sustainable land use strategies as effective ways to mitigate climate change in Southeast Nigeria. The results highlight the importance of conserving the environment, practicing sustainable agriculture, ensuring good governance, encouraging public involvement, and implementing climate adaptation measures to achieve long-term environmental sustainability and improve the lives of local communities.

Table 6: Ethical and Sustainable Land Use Strategies for Mitigating Climate Change Effects

	Ethical and Sustainable Land Use Strategies	Frequency	Percentage
1	Afforestation and reforestation programs should be encouraged to restore degraded lands	231	92.4
2	Sustainable agricultural practices such as crop rotation and organic farming should be promoted	225	90.0
3	Government should strengthen enforcement of environmental and land use regulations	219	87.6
4	Community participation in land use decision-making should be encouraged	204	81.6
5	Environmental education and public awareness campaigns should be intensified	213	85.2
6	Alternative sources of energy should be promoted to reduce dependence on fuelwood	207	82.8
7	Land use planning and urban development policies should prioritize environmental sustainability	216	86.4
8	Soil conservation measures should be adopted to reduce erosion and land degradation	223	89.2
9	Policies promoting equitable land distribution and social justice should be implemented	198	79.2
10	Climate change adaptation and disaster management programs should be strengthened	221	88.4

Conclusion

The study explored the interplay between climate change and land use ethics in Southeast Nigeria, highlighting key contributors to environmental degradation such as deforestation, urban growth, industrial activities, bush burning, and unfavorable agricultural methods. These human actions have exacerbated climate change, leading to significant ecological disruptions, including soil erosion, flooding, reduced agricultural productivity, biodiversity loss, and heightened socio-economic struggles for rural communities. Furthermore, the research identified ethical concerns around land use—like the exploitation of natural resources and inadequate environmental governance—that have intensified the impacts of climate change. Weak environmental policies and their poor enforcement hinder effective adaptation and mitigation efforts. Ultimately, the findings emphasized the importance of ethical land use practices for achieving sustainability and safeguarding the future. The study urged collaboration among governments, communities, and environmental stakeholders to implement sustainable land management approaches, such as afforestation, climate-smart agriculture, and proper urban planning, while valuing indigenous knowledge and community engagement to bolster long-term environmental conservation and resilience in the region.

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