

Social Policy, Education and Environmental Microbiology as Drivers of National Security and Sustainable Development in Nigeria

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ARTICLE INFO

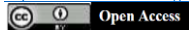
Keywords:

Social policy, education, environmental microbiology, national security, sustainable development, human security, Nigeria.

Vol.01, No.03, 2026

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ABSTRACT

Contemporary security challenges increasingly transcend conventional military threats to encompass public health emergencies, environmental degradation, infectious diseases, antimicrobial resistance, climate change, food insecurity, and educational inequality. These interconnected challenges have reinforced the need for integrated policy approaches that simultaneously strengthen human development, environmental resilience, and national security. This study examines the roles of social policy, education, and environmental microbiology as complementary drivers of national security and sustainable development in Nigeria. Specifically, the paper explores how education-centred social policies and environmental microbiological interventions contribute to human security, public health, environmental protection, and national resilience. A qualitative documentary research design was adopted, drawing on peer-reviewed literature, government publications, and reports from the World Health Organization (WHO), United Nations Development Programme (UNDP), United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Environment Programme (UNEP), World Bank, National Bureau of Statistics (NBS), Federal Ministry of Education, and other authoritative sources published between 2021 and 2026. The study is anchored on Human Capital Theory, Human Security Theory, and Ecological Systems Theory. Findings indicate that educational deprivation, environmental pollution, poor sanitation, unsafe water, antimicrobial resistance, and weak implementation of social policies collectively undermine human well-being, economic productivity, and national stability. Conversely, sustained investment in inclusive education, evidence-based social policies, environmental health systems, and microbiological surveillance enhances community resilience, strengthens public health preparedness, supports sustainable resource management, and reduces multidimensional security risks. The study concludes that Nigeria's pursuit of sustainable development and national security requires integrated policy frameworks that recognise education and environmental microbiology as strategic components of national development planning. The paper recommends stronger intersectoral collaboration, increased investment in education and environmental health, strengthened disease surveillance, and evidence-based policymaking to enhance national resilience.

Introduction

Background of the Study

The twenty-first century has witnessed a fundamental shift in the understanding of national security. While traditional security paradigms emphasised the protection of state sovereignty through military strength and territorial defence, contemporary security discourse increasingly recognises that sustainable national security depends equally on human development, public health, environmental protection, education, and effective social policy. The COVID-19 pandemic, accelerating climate change, antimicrobial resistance (AMR), food insecurity, environmental pollution, and the growing frequency of infectious disease outbreaks have demonstrated that biological and environmental threats can destabilise economies, weaken governance systems, disrupt education, and threaten national security

on a scale comparable to armed conflict. Consequently, the concepts of human security, health security, biosecurity, and environmental security have become central to national development planning and the implementation of the Sustainable Development Goals (SDGs) (United Nations Development Programme [UNDP], 2022).

Globally, the interdependence between education, environmental health, and sustainable development is becoming increasingly evident. The 2026 Global Education Monitoring Report estimates that 273 million children and young people were out of school in 2024, representing approximately one in every six school-age children worldwide. Since 2015, progress in reducing the global out-of-school population has stagnated, with educational disruptions driven by armed conflict, economic shocks, forced displacement, public health emergencies, and shrinking public investment. These educational deficits undermine human capital formation, reduce economic productivity, widen inequality, and weaken national resilience to emerging security challenges.

At the same time, environmental microbiological threats have become a major global policy concern. The World Health Organization identifies antimicrobial resistance as one of the most significant threats to global public health, food security, and development because resistant microorganisms reduce the effectiveness of life-saving medicines, increase healthcare costs, and heighten the risk of disease outbreaks. Poor sanitation, unsafe drinking water, indiscriminate waste disposal, environmental contamination, and climate-induced ecological changes further facilitate the transmission of pathogenic microorganisms and contribute to recurrent outbreaks of cholera, typhoid fever, Lassa fever, and other infectious diseases. These threats underscore the importance of integrating environmental microbiology into broader social and security policies through the globally endorsed One Health approach, which recognises the interdependence of human, animal, and environmental health.

Across Europe, governments have increasingly adopted integrated policy frameworks that link education, environmental sustainability, public health, and national resilience. Following the COVID-19 pandemic and the humanitarian consequences of the Russia–Ukraine conflict, the European Education Area strengthened investment in digital education, lifelong learning, scientific literacy, and research capacity as essential components of democratic resilience and economic competitiveness. The European Commission's 2023 progress report further emphasises that resilient education systems, environmental innovation, and evidence-informed policymaking are indispensable for addressing emerging biological, environmental, and security risks. This policy orientation illustrates a growing international consensus that national security extends beyond defence institutions to include investments in education, science, environmental health, and social protection.

The challenges are considerably more pronounced in Sub-Saharan Africa, where rapid population growth, poverty, weak public infrastructure, environmental degradation, recurrent disease outbreaks, and insecurity continue to constrain sustainable development. The region accounts for one of the world's largest concentrations of children excluded from formal education, while many countries simultaneously experience inadequate access to safe water, sanitation, waste management, and laboratory surveillance systems. These conditions create favourable environments for the emergence and spread of environmentally transmitted infectious diseases, with significant implications for public health, agricultural productivity, food security, and economic stability. Consequently, African development institutions increasingly advocate integrated investments in education, environmental health systems, scientific research, and social protection as complementary strategies for strengthening human security and sustainable development.

Nigeria reflects many of these intersecting challenges. Home to one of Africa's largest populations and one of the continent's largest economies, the country continues to confront complex security threats alongside persistent developmental deficits. UNICEF estimates that approximately 10.5 million children aged 5–14 years remain out of school, representing one of the highest out-of-school populations globally. In conflict-affected north-eastern Nigeria alone, approximately 2.8 million children require education-in-emergencies support, while hundreds of schools and classrooms have been destroyed, damaged, or closed because of insecurity. Educational exclusion is further compounded by poverty, gender inequality, displacement, child labour, and regional disparities, limiting human capital development and reducing opportunities for inclusive economic growth.

Environmental health challenges further compound Nigeria's development and security landscape. Rapid urbanisation, poor waste management, inadequate wastewater treatment, unsafe water sources, indiscriminate disposal of solid waste, and weak environmental sanitation increase exposure to microbial contamination and communicable diseases. These conditions contribute to recurrent outbreaks of cholera, typhoid fever, Lassa fever, and other environmentally associated infections that strain healthcare systems, reduce labour productivity, disrupt school attendance, and impose significant economic costs on households and government. The emergence of antimicrobial resistance has heightened these concerns, reinforcing the need for stronger environmental surveillance, improved laboratory capacity, responsible antimicrobial stewardship, and greater public awareness.

Recognising these interconnected challenges, the Federal Government of Nigeria has initiated reforms aimed at strengthening human capital development and educational outcomes. The Nigeria 2024–2027 Partnership Compact prioritises equitable access to foundational learning, improved school safety and sanitation, enhanced teacher capacity, stronger education management information systems, and increased learning outcomes. Nevertheless, sustained progress requires stronger integration of social policy, education, environmental microbiology, and national security planning. Addressing insecurity through military and law enforcement measures alone is unlikely to produce lasting peace if educational deprivation, environmental health risks, biological threats, and social inequalities remain unresolved. Accordingly, this study argues that integrated investments in social policy, education, and environmental microbiology are indispensable drivers of national security and sustainable development in Nigeria.

Statement of the Problem

Nigeria continues to experience complex and interconnected security challenges, including terrorism, armed banditry, kidnapping, communal conflicts, food insecurity, environmental degradation, public health emergencies, and the growing threat of antimicrobial resistance. These challenges have persisted despite substantial investments in military operations, intelligence gathering, policing, and other conventional security measures. While these interventions remain indispensable, they have largely focused on responding to the manifestations of insecurity rather than addressing the underlying social, educational, environmental, and biological factors that contribute to national vulnerability.

Recent evidence indicates that Nigeria continues to record one of the world's largest populations of out-of-school children, widespread multidimensional poverty, inadequate environmental sanitation, recurring outbreaks of environmentally transmitted infectious diseases, and increasing antimicrobial resistance. Collectively, these challenges weaken human capital development, reduce economic productivity, increase pressure on healthcare systems, undermine environmental sustainability, and heighten community vulnerability to instability and insecurity (UNESCO, 2024; UNICEF, 2025; World Health Organization [WHO], 2024). Although successive governments have introduced reforms in education, public health, environmental protection, and social welfare, these initiatives are often implemented in sectoral silos with limited coordination across ministries and agencies.

Existing literature has examined the relationship between education and economic development, environmental microbiology and public health, and social policy and poverty reduction. Similarly, national security studies have predominantly focused on military capability, intelligence operations, counterterrorism, and law enforcement. However, limited scholarly attention has been given to the integrated contribution of social policy, education, and environmental microbiology as mutually reinforcing drivers of national security and sustainable development. Consequently, there is insufficient empirical synthesis demonstrating how investments in these sectors collectively strengthen national resilience, human security, and sustainable development.

This study addresses this knowledge gap by examining the intersections between social policy, education, environmental microbiology, national security, and sustainable development using contemporary evidence from Nigeria. It argues that sustainable national security requires integrated policy responses that combine educational development, environmental health, scientific innovation, and social protection alongside conventional security interventions.

Objectives of the Study

The broad objective of this study is to examine the roles of social policy, education, and environmental microbiology as drivers of national security and sustainable development in Nigeria.

The specific objectives are to:



1. examine the relationship between social policy, education, environmental microbiology, and national security in Nigeria.
2. assess the contribution of education and environmental microbiology to human security and sustainable development.
3. analyse the implications of educational deprivation and environmental health challenges for national security.
4. propose integrated policy strategies for strengthening national security and sustainable development through investments in social policy, education, and environmental health.

Research Questions

The study seeks to answer the following questions:

1. What relationship exists between social policy, education, environmental microbiology, and national security in Nigeria?
2. How do education and environmental microbiology contribute to sustainable development and human security?
3. In what ways do educational deprivation and environmental health challenges undermine national security?
4. What integrated policy measures can strengthen national security and sustainable development through education, social policy, and environmental microbiology?

Significance of the Study

This study contributes to the growing interdisciplinary literature linking social policy, education, environmental microbiology, national security, and sustainable development. It extends existing scholarship by demonstrating that national security should not be viewed solely through a military lens but also as an outcome of effective investments in human capital, environmental health, scientific innovation, and social protection.

The findings will provide useful evidence for policymakers, including the Office of the National Security Adviser (ONSA), the Federal Ministry of Education, the Federal Ministry of Environment, the Federal Ministry of Health and Social Welfare, the National Agency for Food and Drug Administration and Control (NAFDAC), the Nigeria Centre for Disease Control and Prevention (NCDC), the National Universities Commission (NUC), and development partners seeking integrated approaches to security governance and sustainable development.

The study will also benefit researchers in the fields of social policy, education, environmental microbiology, public health, security studies, and development studies by providing a multidisciplinary framework for understanding the nexus between environmental health, education, and national resilience. Furthermore, the paper supports the achievement of the Sustainable Development Goals, particularly SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 6 (Clean Water and Sanitation), SDG 13 (Climate Action), SDG 16 (Peace, Justice and Strong Institutions), and SDG 17 (Partnerships for the Goals).

Literature Review

Conceptual Review

Social Policy

Social policy refers to deliberate government actions, programmes, laws, and institutional arrangements designed to improve citizens' welfare, reduce inequalities, promote social justice, and enhance human well-being. It encompasses interventions in education, healthcare, employment, housing, social protection, environmental management, and public welfare. Contemporary social policy extends beyond poverty alleviation to include investments that strengthen human capital, promote social cohesion, and enhance national resilience. According to the Organisation for Economic Co-operation and Development (OECD, 2024), effective social policies improve economic productivity, reduce social exclusion, and strengthen public trust in government institutions—all of which contribute to political stability and sustainable development.

Within the national security discourse, social policy is increasingly recognised as a preventive security instrument. Rather than responding only to crises, well-designed social policies address structural drivers of insecurity such as unemployment, inequality, educational deprivation, poor health outcomes, environmental degradation, and social exclusion. Consequently, investment in social

development complements conventional security measures by reducing vulnerabilities that criminal and extremist groups often exploit (UNDP, 2022).

Education and Human Capital Development

Education remains one of the most important instruments for advancing sustainable development and national security. Beyond improving literacy and workforce productivity, education strengthens critical thinking, civic responsibility, innovation, environmental awareness, and social inclusion. It equips individuals with the knowledge and skills needed to participate meaningfully in economic, political, and community life while reducing vulnerability to poverty, crime, misinformation, and violent extremism.

UNESCO (2024) describes education as a catalyst for achieving virtually all the Sustainable Development Goals because it improves health outcomes, promotes gender equality, stimulates innovation, and strengthens democratic governance. Similarly, the World Bank (2024) argues that countries with stronger educational systems generally exhibit higher labour productivity, greater institutional resilience, and better long-term economic performance. In Nigeria, however, educational progress continues to be constrained by inadequate infrastructure, teacher shortages, insecurity, regional disparities, and unequal access to quality learning opportunities, thereby limiting the sector's contribution to national development and security.

Environmental Microbiology

Environmental microbiology is the branch of microbiology concerned with microorganisms and their interactions with natural and built environments, including water, soil, air, food systems, waste, and ecosystems. The discipline contributes significantly to environmental sustainability, disease prevention, food safety, water quality management, pollution control, waste treatment, climate resilience, and public health.

Recent global attention has focused on the environmental dimensions of antimicrobial resistance, emerging infectious diseases, wastewater surveillance, zoonotic pathogens, and microbial contamination resulting from rapid urbanisation and climate change. The World Health Organization (2024) identifies antimicrobial resistance as one of the leading global public health threats because resistant microorganisms compromise the effectiveness of antimicrobial medicines and increase morbidity, mortality, and healthcare costs. Environmental microbiology therefore contributes to national security through disease surveillance, early detection of outbreaks, environmental monitoring, and scientific evidence that informs public health interventions and environmental policies.

National Security and Sustainable Development

National security has evolved from a narrow military conception to a multidimensional framework that incorporates economic stability, environmental sustainability, public health, food security, cybersecurity, and human development. Contemporary security scholars argue that nations are secure not merely because they possess strong armed forces but because their institutions are capable of protecting citizens from both traditional and non-traditional threats.

This broader perspective aligns closely with the concept of sustainable development, defined by the World Commission on Environment and Development as development that meets present needs without compromising the ability of future generations to meet theirs. The 2030 Agenda for Sustainable Development further recognises that peace, justice, strong institutions, quality education, environmental protection, and inclusive societies are mutually reinforcing. Consequently, investments in education, environmental health, scientific innovation, and social welfare contribute simultaneously to national security and sustainable development.

The Nexus among Social Policy, Education, Environmental Microbiology, National Security and Sustainable Development

Although these concepts are frequently studied independently, they are fundamentally interconnected. Social policy provides the institutional framework through which governments invest in education, healthcare, environmental protection, and scientific research. Education develops the human capital required to sustain innovation, economic growth, and responsible environmental stewardship. Environmental microbiology provides the scientific knowledge necessary for controlling infectious diseases, ensuring safe water and food systems, improving sanitation, and strengthening public health

preparedness. Together, these investments enhance human security, improve institutional resilience, promote economic productivity, reduce environmental risks, and strengthen national security.

This study therefore conceptualises national security as a multidimensional outcome influenced by integrated investments in social policy, educational development, and environmental health. Rather than viewing these sectors as independent policy domains, the paper argues that they function as complementary drivers of sustainable development and long-term national resilience.

Theoretical Review

This study is anchored on Human Capital Theory, Human Security Theory, and Ecological Systems Theory. Collectively, these theories provide a robust framework for explaining how investments in social policy, education, and environmental microbiology contribute to national security and sustainable development.

Human Capital Theory

Human Capital Theory, developed principally by Schultz (1961) and Becker (1964), posits that investment in education, skills acquisition, health, and knowledge enhances the productive capacity of individuals and contributes to economic growth and national development. The theory views education as a long-term investment that improves labour productivity, innovation, employability, and social mobility.

Within the context of this study, Human Capital Theory explains how education strengthens national security by equipping citizens with the knowledge, competencies, and critical thinking skills required for productive employment, responsible citizenship, environmental stewardship, and informed public health practices. An educated population is generally less vulnerable to poverty, criminality, violent extremism, misinformation, and social exclusion. Consequently, sustained investment in education constitutes both a development strategy and a preventive security measure.

Human Security Theory

Human Security Theory emerged from the United Nations Development Programme's *Human Development Report* (1994) and has gained increasing relevance in contemporary security scholarship. The theory broadens the concept of security beyond military defence to include protection from poverty, disease, environmental degradation, food insecurity, unemployment, political instability, and other threats that undermine human well-being.

The relevance of Human Security Theory to this study lies in its recognition that education, public health, environmental quality, and effective social policies are integral components of national security. Environmental microbiology contributes directly to human security through disease surveillance, water quality monitoring, food safety, antimicrobial resistance control, and environmental sanitation. Likewise, social policy strengthens resilience by expanding access to education, healthcare, and social protection, thereby reducing structural vulnerabilities that may contribute to insecurity.

Ecological Systems Theory

Ecological Systems Theory, proposed by Bronfenbrenner (1979), explains that human development and behaviour are shaped by dynamic interactions between individuals and the multiple environmental systems in which they live, including families, schools, communities, institutions, and the broader physical environment. Although originally developed within developmental psychology, the theory has been widely applied in public health, environmental studies, education, and social policy.

The theory is particularly relevant because it recognises that national security and sustainable development are influenced by interconnected social, educational, institutional, and environmental factors rather than isolated interventions. Environmental conditions, public policies, educational systems, healthcare services, and community structures interact to influence health outcomes, social cohesion, and resilience. Accordingly, strengthening national security requires coordinated investments across these interconnected systems rather than reliance on conventional security institutions alone.

Theoretical Synthesis

The three theories complement one another in explaining the central argument of this study. Human Capital Theory demonstrates the developmental value of investing in education; Human Security Theory broadens national security to encompass health, environmental, and social well-being; while Ecological Systems Theory explains the interconnectedness of educational, environmental, institutional, and social systems. Together, they provide an appropriate analytical framework for examining how

social policy, education, and environmental microbiology jointly contribute to national security and sustainable development in Nigeria.

Empirical Review

Recent empirical evidence increasingly demonstrates that social policy, education, environmental health, and national security are mutually reinforcing components of sustainable development. Although these relationships have often been examined separately, contemporary studies suggest that integrated investments in human capital, environmental protection, and public health strengthen national resilience against both conventional and non-conventional security threats.

Global Evidence

Globally, empirical studies consistently show that countries with stronger education systems, effective social protection programmes, and robust environmental health policies experience better development outcomes and greater societal resilience. The UNDP Human Development Report (2021/2022) found that countries investing in education, healthcare, and social protection recovered more effectively from the COVID-19 pandemic and demonstrated greater institutional resilience to economic and public health shocks. Similarly, the World Bank (2024) reported that investments in human capital significantly improve labour productivity, innovation, social cohesion, and long-term economic growth.

Recent evidence has also elevated environmental microbiology within the global security agenda. The World Health Organization identifies antimicrobial resistance (AMR) as one of the leading global public health threats, while growing evidence demonstrates that wastewater, contaminated water sources, food systems, and environmental pollution facilitate the transmission of resistant microorganisms and emerging infectious diseases. Environmental surveillance has therefore become an essential component of disease prevention, epidemic preparedness, and biosecurity.

European Evidence

Across Europe, governments increasingly integrate education, scientific research, environmental sustainability, and public health into broader resilience and security policies. The European Education Area promotes quality education, digital innovation, environmental literacy, and research capacity as essential pillars of economic competitiveness and democratic resilience. Recent studies further argue that microbiology education should incorporate sustainability principles to equip future scientists with competencies for addressing climate change, pollution, biodiversity loss, and environmental health challenges. These findings suggest that investments in education and environmental science extend beyond economic development to strengthen national preparedness for emerging biological and environmental threats.

Evidence from Sub-Saharan Africa

Empirical evidence from Sub-Saharan Africa indicates that educational inequality, weak environmental governance, inadequate sanitation, and limited disease surveillance continue to undermine sustainable development and human security. Several studies have associated poor wastewater management, unsafe drinking water, and inadequate environmental sanitation with increased risks of infectious disease transmission and antimicrobial resistance. Recent One Health research in West Africa demonstrates that community-centred health education significantly improves public knowledge and environmental practices related to wastewater management and antimicrobial resistance prevention, highlighting the importance of integrating education with environmental microbiology and public policy.

Evidence from Nigeria

Recent Nigerian studies similarly support the interconnectedness of education, environmental health, and national security. Research on the Safe Schools Programme indicates that strengthening school safety, institutional coordination, and educational governance contributes to improved learning environments in areas affected by insecurity. Other studies have shown that inadequate school health systems, poor sanitation, and microbial contamination negatively affect learners' health, attendance, and educational outcomes, thereby weakening human capital development.

Environmental microbiological research in Nigeria has further demonstrated the growing significance of wastewater surveillance for detecting antimicrobial resistance within communities and supporting evidence-based public health interventions. Household wastewater monitoring has been

identified as a valuable early-warning mechanism for understanding community-level antimicrobial resistance patterns and informing environmental health policies. Collectively, these studies indicate that educational investment, environmental health management, and scientific surveillance are increasingly recognised as strategic assets for strengthening public health, national security, and sustainable development.

Knowledge Gap

The reviewed literature demonstrates substantial progress in understanding the individual contributions of social policy, education, environmental microbiology, public health, and national security. However, most existing studies examine these variables independently or focus on a single sector. Limited attention has been given to their integrated contribution to national security and sustainable development within the Nigerian context. Furthermore, few studies have synthesised recent evidence across social policy, educational development, and environmental microbiology to explain how coordinated investments in these sectors strengthen human security and national resilience. This study addresses that gap by developing an interdisciplinary framework that positions social policy, education, and environmental microbiology as complementary drivers of national security and sustainable development in Nigeria.

Methodology

This study adopted a qualitative documentary research design, relying exclusively on secondary data to examine the relationships among social policy, education, environmental microbiology, national security, and sustainable development in Nigeria. A documentary approach was considered appropriate because the study sought to synthesise existing empirical evidence, policy documents, and statistical reports rather than generate primary data.

Data were obtained from credible national and international sources published predominantly between 2021 and 2026. These included reports and datasets from the World Health Organization (WHO), United Nations Development Programme (UNDP), United Nations Educational, Scientific and Cultural Organization (UNESCO), United Nations Children's Fund (UNICEF), United Nations Environment Programme (UNEP), World Bank, Organisation for Economic Co-operation and Development (OECD), National Bureau of Statistics (NBS), Federal Ministry of Education (FME), Universal Basic Education Commission (UBEC), Nigeria Centre for Disease Control and Prevention (NCDC), National Agency for Food and Drug Administration and Control (NAFDAC), and relevant peer-reviewed journal articles.

Purposive sampling was employed in selecting literature that directly addressed social policy, education, environmental microbiology, national security, human security, environmental sustainability, antimicrobial resistance, and sustainable development. To ensure currency and policy relevance, emphasis was placed on publications produced between 2021 and 2026, while a limited number of foundational theoretical works were retained to explain the conceptual and theoretical underpinnings of the study.

Data were analysed using thematic content analysis. The reviewed literature was systematically organised into major themes, including social policy and governance, educational development, environmental microbiology, public health, national security, and sustainable development. The findings from these themes were synthesised to identify areas of convergence, policy implications, and interdisciplinary linkages relevant to Nigeria's development context.

The credibility of the study was enhanced through data triangulation, whereby evidence from multiple authoritative sources was compared and corroborated. This approach improved the reliability of the findings and reduced the likelihood of bias associated with dependence on a single source of information.

Discussion of Findings

Social Policy, Human Capital Development and National Security

The findings of this study demonstrate that social policy constitutes one of the most important instruments through which governments strengthen national security and promote sustainable development. While conventional security approaches emphasise military preparedness, intelligence gathering, and law enforcement, contemporary evidence indicates that long-term national stability depends equally on investments that improve citizens' welfare, educational attainment, healthcare,

employment opportunities, and environmental conditions. Consequently, effective social policies reduce structural vulnerabilities that frequently manifest as insecurity, violent extremism, organised crime, social unrest, and economic instability.

Education emerged as one of the strongest components of social policy with direct implications for national security. Consistent with Human Capital Theory, investments in education increase labour productivity, improve civic participation, enhance innovation, and expand economic opportunities, thereby reducing conditions associated with poverty, unemployment, and social exclusion. The World Bank (2024) observes that countries with stronger human capital generally experience higher economic growth, stronger institutional performance, and greater resilience to economic and social shocks. Likewise, UNESCO (2024) maintains that education contributes directly to peacebuilding by promoting tolerance, social cohesion, democratic values, and critical thinking.

The Nigerian experience reinforces these global findings. Despite recent reforms, educational exclusion remains a major development challenge. UNICEF (2025) estimates that approximately 10.5 million Nigerian children aged 5–14 years remain out of school, while conflict and displacement continue to disrupt learning in several states. Educational deprivation reduces future employment opportunities, limits social mobility, and weakens human capital formation. These conditions increase vulnerability to recruitment by criminal networks, violent extremist groups, and other non-state actors, particularly where economic opportunities remain limited.

Furthermore, the National Bureau of Statistics (2022) reported that about 133 million Nigerians were living in multidimensional poverty, reflecting simultaneous deprivation in education, health, housing, employment, sanitation, and living standards. Although poverty alone does not automatically produce insecurity, its interaction with educational disadvantage, unemployment, weak institutions, and social exclusion creates environments in which violence and criminality are more likely to flourish. These findings support the argument that social policies addressing educational access, poverty reduction, youth empowerment, and social protection should be viewed as preventive national security investments rather than merely welfare interventions.

Recent government initiatives demonstrate the strategic value of education-centred social policies. The Nigeria Education Sector Renewal Initiative, the 2024–2027 Partnership Compact, and the HOPE for Quality Basic Education for All (HOPE-EDU) programme seek to improve foundational learning, teacher effectiveness, school governance, educational financing, and equitable access to quality education. Similarly, the Nigerian Education Loan Fund (NELFUND) has expanded opportunities for tertiary education by reducing financial barriers for eligible students. Although these reforms are still evolving, they illustrate increasing recognition that educational investment contributes to national competitiveness, human capital development, and long-term social stability.

The findings therefore suggest that education should no longer be regarded solely as a social service but as a strategic national security asset. Countries that consistently invest in quality education, lifelong learning, and inclusive human capital development are generally better positioned to respond to economic crises, technological change, environmental challenges, and emerging security threats. For Nigeria, integrating education more explicitly into national security planning would strengthen preventive security by addressing many of the structural conditions that underlie instability.

Environmental Microbiology, Public Health and Human Security

The study further reveals that environmental microbiology has become an increasingly important component of contemporary national security. Traditionally, microbiology has been associated primarily with clinical medicine and laboratory science. However, recent developments in global health, environmental protection, and biosecurity demonstrate that microorganisms and their interactions with water, soil, food systems, waste, animals, and ecosystems have profound implications for national resilience, economic productivity, and sustainable development.

The COVID-19 pandemic fundamentally altered global perceptions of biological threats by demonstrating how infectious diseases can simultaneously overwhelm healthcare systems, disrupt economies, interrupt education, reduce labour productivity, and threaten national security. Similar concerns have emerged regarding antimicrobial resistance (AMR), which the World Health Organization (2024) identifies as one of the leading global public health threats of the twenty-first century. Resistant microorganisms increase treatment failures, prolong hospitalisation, elevate

healthcare costs, and heighten mortality risks. From a national security perspective, widespread antimicrobial resistance weakens public health preparedness, reduces workforce productivity, and increases pressure on already constrained health systems.

Nigeria continues to experience significant environmental health challenges that reinforce these concerns. Rapid urbanisation, inadequate waste management, unsafe water supplies, poor sanitation, indiscriminate disposal of domestic and industrial waste, and weak environmental monitoring create favourable conditions for the transmission of waterborne and environmentally associated infectious diseases. Recurrent outbreaks of cholera, Lassa fever, typhoid fever, and other communicable diseases illustrate the close relationship between environmental conditions and human security. These disease outbreaks not only affect public health but also disrupt schooling, reduce economic productivity, increase healthcare expenditure, and undermine community resilience.

Environmental microbiology provides scientific tools for addressing these challenges through water quality monitoring, wastewater surveillance, food safety assessment, environmental risk analysis, pathogen detection, and antimicrobial resistance surveillance. Recent advances in wastewater-based epidemiology have demonstrated the value of environmental surveillance as an early-warning system for detecting disease outbreaks and monitoring antimicrobial resistance within communities. Such evidence supports timely public health interventions and strengthens national preparedness for biological emergencies.

The findings therefore support the growing international consensus that environmental health should form an integral component of national security planning. Strengthening environmental microbiological research, laboratory capacity, disease surveillance systems, sanitation infrastructure, and public health education will not only improve health outcomes but also enhance national resilience against biological threats. Consequently, environmental microbiology should be recognised as a strategic contributor to both human security and sustainable development rather than merely a specialised scientific discipline.

Education, Scientific Innovation and Sustainable Development

The findings indicate that education extends beyond the acquisition of knowledge to serve as a strategic investment in scientific innovation, environmental stewardship, economic productivity, and national resilience. Sustainable development increasingly depends on the capacity of countries to generate scientific knowledge, develop innovative technologies, and produce a skilled workforce capable of responding to emerging environmental, health, and security challenges. Consequently, education provides the foundation upon which effective social policies, scientific research, and evidence-based decision-making are built.

Recent international evidence demonstrates that countries with stronger educational systems generally invest more in research and development, environmental protection, biotechnology, and public health preparedness. According to UNESCO (2024), quality education enhances scientific literacy, promotes innovation, and equips citizens with the competencies required to address complex global challenges, including climate change, environmental pollution, food insecurity, and infectious diseases. Similarly, the World Bank (2024) argues that investments in education significantly improve labour productivity, technological advancement, institutional effectiveness, and long-term economic competitiveness.

Within the context of environmental microbiology, education plays a critical role in developing the scientific workforce required for disease surveillance, laboratory diagnostics, environmental monitoring, food safety, water quality management, and antimicrobial resistance surveillance. Universities and research institutions produce microbiologists, environmental scientists, epidemiologists, and public health professionals whose expertise contributes directly to disease prevention and environmental protection. Beyond higher education, public education campaigns improve environmental sanitation practices, promote rational antimicrobial use, encourage proper waste disposal, and strengthen community participation in disease prevention.

For Nigeria, strengthening Science, Technology, Engineering and Mathematics (STEM) education, laboratory infrastructure, research funding, and university–industry collaboration would enhance national capacity to respond to biological threats while supporting economic diversification and sustainable development. Increased investment in scientific education would also strengthen indigenous

research capabilities, reduce dependence on imported technologies, and improve preparedness for future public health emergencies. These findings suggest that education should be viewed not merely as a social service but as a strategic investment in national resilience, scientific advancement, and sustainable development.

Intersectoral Collaboration as a Driver of National Resilience

Another important finding of this study is that contemporary national security challenges cannot be effectively addressed through isolated institutional responses. Rather, they require coordinated action involving government ministries, educational institutions, environmental agencies, public health organisations, security institutions, research centres, civil society organisations, and the private sector. This reflects the growing international acceptance of the Whole-of-Government and Whole-of-Society approaches to governance, which emphasise collaboration in addressing multidimensional threats.

In Nigeria, policy implementation often remains fragmented, with ministries and agencies pursuing sector-specific mandates despite addressing interconnected problems. For example, educational planning may not sufficiently incorporate environmental health considerations, while environmental policies may receive limited input from educational institutions or security agencies. Similarly, disease surveillance systems may operate independently of broader national security planning despite the security implications of epidemics, antimicrobial resistance, and environmental degradation.

The findings demonstrate that stronger institutional coordination would generate significant benefits. Collaboration between the Federal Ministry of Education, Federal Ministry of Environment, Federal Ministry of Health and Social Welfare, Nigeria Centre for Disease Control and Prevention (NCDC), National Agency for Food and Drug Administration and Control (NAFDAC), National Environmental Standards and Regulations Enforcement Agency (NESREA), National Universities Commission (NUC), Office of the National Security Adviser (ONSA), and research institutions would improve information sharing, evidence-based policymaking, environmental surveillance, emergency preparedness, and public awareness.

Furthermore, interdisciplinary collaboration among universities would encourage joint research involving social scientists, microbiologists, environmental scientists, educators, economists, and security experts. Such collaboration would generate comprehensive policy solutions capable of addressing the complex interactions between environmental degradation, education, public health, social inequality, and national security. These findings reinforce the argument that sustainable development is best achieved through integrated governance rather than isolated sectoral interventions.

Towards an Integrated Policy Framework for Nigeria

The central argument emerging from this study is that social policy, education, and environmental microbiology should be recognised as mutually reinforcing pillars of national security and sustainable development. Conventional security strategies remain indispensable for protecting territorial integrity and responding to immediate threats. However, enduring peace and national resilience require complementary investments that strengthen human capital, improve environmental quality, protect public health, and reduce structural vulnerabilities.

An integrated policy framework would position social policy as the overarching mechanism through which government invests in education, environmental health, scientific research, and social protection. Education would serve as the primary driver of human capital development, innovation, civic responsibility, and environmental awareness. Environmental microbiology would provide the scientific evidence necessary for disease surveillance, environmental monitoring, food safety, antimicrobial resistance control, and biosecurity. Together, these sectors would strengthen public institutions, improve community resilience, support sustainable resource management, and enhance national preparedness for both traditional and non-traditional security threats.

The findings therefore support a paradigm shift from reactive security governance towards preventive, knowledge-driven, and development-oriented security. Such an approach recognises that national security is not solely the responsibility of defence and law enforcement institutions but also depends on effective schools, healthy environments, scientific innovation, inclusive social policies, and resilient communities. For Nigeria, integrating these sectors into national development planning would not only improve human well-being but also contribute significantly to economic growth, environmental sustainability, social stability, and the achievement of the Sustainable Development Goals.

The interdisciplinary framework advanced in this study represents its principal contribution to knowledge. By demonstrating the interconnected roles of social policy, education, and environmental microbiology in strengthening national security, the paper extends existing scholarship beyond traditional sector-specific analyses and provides a comprehensive policy perspective for promoting sustainable development in Nigeria.

Conclusion

This study examined the interconnected roles of social policy, education, and environmental microbiology as drivers of national security and sustainable development in Nigeria. The findings demonstrate that contemporary national security extends beyond the traditional responsibilities of the military and law enforcement agencies to include strategic investments in human capital development, environmental health, scientific research, and evidence-based social policies. Persistent educational deprivation, environmental degradation, poor sanitation, weak environmental surveillance, antimicrobial resistance, and inadequate policy coordination continue to undermine human security, economic productivity, and national resilience.

The study further established that education remains a critical instrument for developing the skilled workforce, scientific capacity, and civic responsibility required for sustainable development. Likewise, environmental microbiology contributes significantly to disease surveillance, food safety, water quality management, environmental monitoring, antimicrobial resistance control, and epidemic preparedness, all of which are increasingly recognised as important dimensions of national security. These contributions, however, can only achieve maximum impact when supported by coherent social policies and effective intersectoral collaboration.

The study therefore concludes that sustainable national security in Nigeria requires a paradigm shift from predominantly reactive security responses towards integrated development-oriented strategies that strengthen education, environmental health, scientific innovation, and social protection. Positioning these sectors as complementary pillars of national development will enhance human security, improve institutional resilience, support sustainable economic growth, and accelerate the achievement of the Sustainable Development Goals.

Recommendations

Recommendation One

The Federal Government of Nigeria should institutionalise education, environmental health, and scientific research as strategic pillars of national security and sustainable development.

Implementation Strategies

- i. The Office of the National Security Adviser (ONSA), in collaboration with the Federal Ministry of Education, Federal Ministry of Environment, Federal Ministry of Health and Social Welfare, and the National Security Strategy Review Committee to integrate education, environmental health, and biosecurity indicators into Nigeria's National Security Strategy and related national policy frameworks.
- ii. The National Planning Commission (Federal Ministry of Budget and Economic Planning), in collaboration with the National Assembly, to mainstream education, environmental sustainability, and scientific innovation into national development plans, annual budgets, and sectoral performance frameworks.

Recommendation Two

The Federal Government should strengthen investment in quality education, scientific innovation, and environmental microbiology

Implementation Strategies

- i. The Federal Ministry of Education in collaboration with the National Universities Commission (NUC), Tertiary Education Trust Fund (TETFund), Universal Basic Education Commission (UBEC), and Nigerian Education Loan Fund (NELFUND) to expand investment in STEM education, environmental microbiology programmes, research laboratories, teacher development, digital learning infrastructure, and equitable access to quality education.
- ii. TETFund, in collaboration with the National Research Fund, universities, research institutes, and the private sector to increase funding for interdisciplinary research, innovation,

biotechnology, environmental surveillance, and postgraduate training that address emerging environmental and national security challenges.

Recommendation Three

The Federal Government should strengthen environmental health governance and national biosecurity systems

Implementation Strategies

- i. The Federal Ministry of Environment in collaboration with the Nigeria Centre for Disease Control and Prevention (NCDC), National Agency for Food and Drug Administration and Control (NAFDAC), National Environmental Standards and Regulations Enforcement Agency (NESREA), and State Ministries of Environment to strengthen environmental surveillance, antimicrobial resistance monitoring, water quality assessment, food safety systems, and laboratory capacity across the country.
- ii. State Governments in collaboration with Local Government Authorities to improve environmental sanitation, waste management systems, wastewater treatment infrastructure, and public health education through sustained community engagement and behavioural change programmes.

Recommendation Four

The Federal Government should institutionalise intersectoral collaboration as a framework for strengthening national security and sustainable development.

Implementation Strategies

- i. The Office of the Secretary to the Government of the Federation (OSGF), in collaboration with the Office of the National Security Adviser (ONSA), to establish a National Intersectoral Coordination Framework involving the Federal Ministries of Education, Environment, Health and Social Welfare, Agriculture and Food Security, Water Resources and Sanitation, Science, Innovation and Technology, and relevant security agencies for coordinated policy implementation
- ii. Universities in collaboration with research institutes, professional associations, civil society organisations, development partners, and the private sector to strengthen interdisciplinary research, policy dialogue, knowledge exchange, and evidence-based advocacy on the intersections of social policy, education, environmental microbiology, national security, and sustainable development.

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