



(REVIEW ARTICLE)

## Effect of threatened bio-diversity on human security in Nigeria's Niger delta

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### Abstract

Arrays of human activities from population explosion, urbanisation, gas flaring, oil spillage to destruction of mangrove duly translate to threatened biodiversity, even as such extensively results in animals cohabiting with one another and with humans which subsequently triggers zoonotic diseases, as evidence in the outbreak of COVID-19 pandemic and lately the monkey pox. It was against this background that this study leverages on Frustration Aggression Theory to analyse effects of threatened biodiversity on human security in the Niger Delta of Nigeria. The study employs food security and health security to measure human security. This study engages qualitative research design of publicly available archived documents with reliance on secondary data. The research is conducted by reviewing literature pertaining to threatened biodiversity. The literature was obtained through searches in publicly available material. Literature from non-serial publications, official reports, and conferences has been included particularly if they have been cited by other references in term biodiversity and human security. Results that emanate from this study revealed threatened biodiversity correlate with food insecurity, while result also shows a nexus between health insecurity and threatened biodiversity which extensively impacted on human productivity. This study submits that environmental hazards quickens decent living of humans. The study recommends that a cleaner environmental climate should be pursued by both State armed actors and non-state armed actors. While the Niger Delta Development Commission and the Federal Government should also give priority to enlightenment of activities negatively impacting biodiversity thus endangering both food security and health security.

**Keywords:** Bio-Diversity; Eco-System Diversity; Food Security; Health Security

### 1. Introduction

The aggravation of arrays of human activities through population explosion, deforestation and urbanisation, use of chemical based fertilizers, pesticides, emission from the consumption of fossils fuel duly encroached upon the natural world, since these engagements transmits to the reduction of the size and number of ecosystems. These extensively results in animals cohabits in closer quarters with one another and with humans, creating ideal conditions for the spread of zoonotic diseases of which 60% of infectious diseases originate from animals and 70% of emerging infectious diseases originate from wildlife. While some are apprehensive that environmental regulations and the safeguarding of nature could threaten businesses, thereby foreclosing the gains of more jobs behind natural landscapes (World Economic Forum, 2020).

Interestingly, biodiversity due to protected natural areas has been linked to decrease of disease such as Lyme disease and malaria. This aptly translates that the more the species, the more secured humanity is away from food insecurity, health insecurity and environmental insecurity. (Uluocha & Okeke, 2014). Environmental insecurity could be triggered through various means spanning from oil spillage (Akani *et al.*, 2019), deforestation of mangroves (Enaruvbe and Atafo,

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2016), and flaring of gases (Ogbe, 2011), which could distort, either directly or indirectly, the continued functioning of ecosystem processes (Díaz *et al.*, 2006). The service of formation, retention, and sustained fertility of soils necessary for the production of plants and animals, considered important by human societies relies on the ecosystem processes of decomposition, nutrient cycling by soil micro biota, and the retention of water and soil particles by a well-developed root network (World Economy Forum, 2020).

Evidentially, biodiversity underpins global nutrition to ensure food security as millions of species work together to provide us with a large array of fruits, vegetables and animal products essential to a healthy, balanced diet, the threatened biodiversity could be seen in the reduced resilience in our supply chains and on our serving plates, even as the number of rice varieties cultivated in Asia has dropped from tens of thousands to just a few dozen; in Thailand, 50% of land used for growing rice only produces two varieties (Quinney, 2020). Nigeria as one of the leading country with high forest loss in the world of 3.3%, and 37.7%. The rate of degradation or loss is high without corresponding replacement has resulted to a major threat to human food security and the environment itself. Some of the effects of environmental degradation include increased rate and intensity of erosions, flooding, etc. The loss of forest resources through excessive exploitation, illegal poaching, and deforestation, uses of chemicals, logging, and bush burning is having an impacts on the diversity, composition, abundance of biodiversity in the Niger Delta (Ogboru & Anga, 2015).

Several species of plants, mammals, reptiles, avian fauna, amphibians, fisheries, insects, microbes have been reported in the Niger Delta ecosystem (Izah *et al.*, 2020). Niger Delta is home to some endemic species including Sclater's guenon (*Cercopithecus sclateri*), Nigerian white-throated guenon (*Cercopithecus erythrogaster pococki*), red-capped mangabey (*Cercocebus torquatus*) and the endangered Nigeria–Cameroon chimpanzee (*Pan Troglodytes ellioti*) (Ikemeh, 2015). Ubom (2010) reported the presence of 339 plant species which are distributed into 88 families in some areas within the Niger Delta region. In different locations, several plant species have been reported. The conservation of species is crucial for healthy societies and ecosystems, to prevent diet-related diseases and reduce the environmental impact of feeding ourselves. Higher rates of biodiversity have been linked to an increase in human health. First, plants are essential for medicines, such that 25% of drugs used in modern medicine are derived from rainforest plants while 70% of cancer drugs are natural or synthetic products inspired by nature and this then translates that for every time a species goes extinct a potential new medicine is missed (World Economic Forum, 2020). The health security of humans are fully dependent on Earth's ecosystems and the services that they provide, such as food, clean water, disease regulation, climate regulation, spiritual fulfillment, aesthetic enjoyment and of which all these becomes threatened through biodiversity extinctions (Green Facts 2015).

The Nigeria's Niger Delta wetlands have been referred to as largest biodiversity hotspots in Africa that inhabit several species that are endemic in the region, such that, several biodiversity internationally and locally endangered are also found in the Niger Delta region (Izah *et al.*, 2020; Ogbe, 2017).

To achieve the objective of this study, answers are provided to the below research questions;

- To what extent does threatened bio-diversity affect health security in Nigeria's Niger Delta?
- How does threatened bio-diversity affect food security in Nigeria's Niger Delta?

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## 2. Literature Review

### 2.1. Conceptual Review

#### 2.1.1. Bio-Diversity

Biodiversity is the biological variety and variability of life on Earth. It is a measure of variation at the genetic, species, and ecosystem level, which is not distributed evenly on earth, and is richer in the tropics (Gaston *et al.*, 2013). These tropical forest ecosystems cover less than ten percent of earth's surface, and contain about ninety percent of the world's species. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but may likely slowdown in the future as a primary result of deforestation. (Rabosky & Daniel, 2009; Myers *et al.*, 2020). Bio-diversity is, the different kinds of life available in the environment and in their variety; of animals, plants, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life.

Biodiversity is the diversity of life. The Convention on Biological Diversity defines biological diversity as “variability among living organisms”. It includes the diversity of ecosystems, the range of species, and genetic diversity within. The

role of biodiversity in food security. Biodiversity and food security are connected in many ways. Across scales from genes to species, landscapes, and biomes, biodiversity is an important resource for humanity. It is the key for a broad range of services provided by ecosystems. Biodiversity helps regulate the nutrient cycle and water (floods) and mitigates impacts of climate change. Biodiversity is also of direct importance for human well-being and for cultural and other values including recreation. The provisioning of clean water and diverse food supply makes it vital for all people. Biodiversity at all levels, including the diversity of genes, species, and ecosystems, is lost at alarming rates. Critical factors for these trends are habitat destruction, global warming, and the uncontrolled spread of alien species. Pollution, nitrogen deposition, and shifts in precipitation further affect biodiversity.

### 2.1.2. Ecosystem Diversity and Nigeria's Niger Delta Eco-system

Eco-system diversity deals with the variations in ecosystems within a geographical location and its overall impact on human existence and the environment. It addresses the combined characteristics of biotic properties (bio-diversity) and abiotic properties (geo-diversity). Ecological diversity includes the variation in both terrestrial and aquatic ecosystems. Ecological diversity can also take into account the variation in the complexity of a biological community, including the number of different niches, the number of trophic levels and other ecological processes. An example of ecological diversity, such as deserts, forests, grasslands, wetlands and oceans.

The Niger Delta is geographically the southern part of the country. It is predominantly a flat, low-lying sedimentary basin drained by the Niger River with several crisscrossed rivers, streams and creeks that empties into the Atlantic Ocean through the estuaries (Igu & Marchant, 2017). It covers Abia, Akwa-Ibom, Bayelsa, Cross Rivers, Delta, Edo, Imo, Ondo and Rivers states of Nigeria. The largest wetland in Africa is approximately 70,000km<sup>2</sup> about 2,370 square kilometers of the Niger Delta region includes rivers, creeks and estuaries and 8,600 square kilometers is made up of stagnant swamp (Ogbe, 2011). The major distinct ecosystem found in the zone include barrier islands, estuaries, mangroves, freshwater swamps, lowland rainforests, creeks and creeklets (Izah *et al.*, 2020). The Niger Delta ecosystem has six unique ecological zones including rainforest, mangrove, flood forest zone, eastern flank, marsh forest zone and barrier islands. (Blench & Roger, 2017; Ayanlade, 2021).

### 2.1.3. Threatened Bio-Diversity and the Niger Delta Ecosystem

The United Nations designated 2011–2020 as the United Nations Decade on Biodiversity and 2021–2030 as the United Nations Decade on Ecosystem Restoration. According to a 2019 Global Assessment Report on Biodiversity and Ecosystem Services submits that 25% of plant and animal species are threatened with extinction as the result of human activity (Watts, 2019; Plumer, 2019). The Niger Delta wetlands have been referred to as largest biodiversity hotspots in Africa that inhabit several species that are endemic in the region of which such biodiversity are internationally and locally endangered as seen in the Niger Delta region (Ogbe, 2011)

Mangroves acts as buffer against wave action, aid in filtering water resources, carbon sink, and thereby minimize the effect of global warming, protection of arable land and coastal region, and minimizing the effect of erosion and flooding. The need to therefore look in the way of reviving and sustaining the ecosystem as a strategy to curing the effect of global warming cannot be overemphasized (Eleanya *et al.*, 2015).

Studies have shown that several activities of man pose threats to bio-diversity. Urbanization, industrialization, intense agricultural practices, deforestation, use of chemical based fertilizers, pesticides, emission from the consumption of fossils fuel are some of the major factor leading to environmental degradation. (Uluocha & Okeke, 2014). Also, Izah *et al.* (2020), listed human activities and bio geophysical effects including positive population growth rate, urbanization/ industrialization, emission emanating from industrial activities such as mining, oil and gas activities, unrestrained tilling of soil for crop production, over-grazing, logging/lumbering. Others are, unmatched land reclamation, dam construction, physical infrastructure, erosion, sea rising, alien invasion, sand storm, desertification, droughts etc. as important factors threatening wetland resource of the Niger Delta region. The rate of deforestation is high leading to loss of valuable plants species and animal habitats thereby exposing them to excessive exploitation.

Neto (2015) stated that the tusks of hippo (*Hippopotamus amphibious*) can be used for aphrodisiacs and ornamentals, and the fat extracted from manatee (*Trichechus Senegalensis*) can be used to cure rheumatism, boils, and backache. Same goes for the blood of the black caiman (*Melanosuchus niger*) can used to treat epilepsy and stroke; ants of the genus *Pseudomyrmex* can be used for the treatment of toothache and reliving painful joints pains; the various anatomical parts of the rattlesnake (*Crotalus*) are used for the treatment of infirmities ranging from boils to bronchitis; the fresh manure of a dromedary (*Camelus dromedaries*) is applied externally on the affected parts to alleviate arthritis; the fats of lion (*Panthera leo*) and hyena (*Crocuta crocuta*) can be used to alleviate abdominal pains; hooves of duikers (*Sylvicapra grimmia*) and antelopes (*Hippotragus equines*) are used as special container for concoctions with herbs to

appease traditional gods and witches. Niger Delta mangroves have social values including therapeutic, amenity, spiritual, heritage and existence values (James *et al.*, 2013).

Eludoyin *et al.* (2015) reported the presence of 37 plant species with medicinal properties around University of Port Harcourt, Rivers state such as Uzodimma (2019) also reported the presence of 72 plant species used by the indigenous people of Ogii in Okigwe, Imo State for the treatment of different type of ailments. The implication here is that, herbal treatment or trado-medical solutions are in high demand not just in rural areas, but urban centers. This demand is giving rise to the incursions on the natural habitat of both plants and animals. The high rate of deforestation, loss of cropland/secondary vegetation and water body is leading to environmental degradation thereby enhancing loss of biodiversity and forest goods and services (Enaruvbe & Atafu, 2016). Several human activities including oil and gas exploration, dredging, invasive plant infestation and wetland reclamation in addition to increased exploration, population growth and weak governance have led to increase case of water pollution/contamination, fish migration, and shrinkage of wetland region of the Niger Delta (Adekola & Mitchell, 2011).

#### 2.1.4. Human Security

The United Nations Development Programmes in its development Report of 1994 provided a milestone publication in the field of human security. The main argument was that ensuring “freedom from want” and “freedom from fear” for all persons is the best way to go about tackling global insecurity. Global attention was drawn to the concept of human security and also sought to influence the UN's 1995 World Summit on Social Development in Copenhagen.

##### Food Security

Food security according to Food and Agricultural Organisation (FAO) exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for active and healthy life. Thus, to achieve food security in Nigeria is a task that requires a holistic approach in terms of commitment, knowledge and skills acquisition by all categories of individuals especially the youths at all levels of education. Food security is usually framed in four dimensions food availability, access to food, food use, utilization and food stability (FAO, 2016).

Food security requires that all people at all times have both physical and economic access to basic food. According to the United Nations, the overall availability of food is not a problem, rather the problem often is the poor distribution of food and a lack of purchasing power. In the past, food security problems have been dealt with at both national and global levels. However, their impacts are limited. According to UN, the key is to tackle the problems relating to access to assets, work and assured income. There is no gainsaying that once Food security is threatened it will take a tow on economic security.

##### Health Security

Health security is a complete physical, mental and social well-being and not merely the absence of disease or infirmity (World Health Organisation, 2004). Health security is one of the vital components of human security, as good health is both essential and instrumental to human survival, livelihood and dignity (Human Security Unit, 2013). The stable health of a population is also important for productivity, social cohesion and stability. Health security strive to close gaps in preparedness and accelerate progress toward a world safe and secure from infectious disease threats. The impact of health security on human security can be measured on the scale of the disease burden now and into the future, the urgency for action, the depth and extent of the impact on society, and the interdependencies or “externalities” that can exert ripple effects beyond particular diseases, persons or locations (Concept of Human Security, 2003).

Due to the importance of medicinal animals, excessive exploitation could pose danger to traditional health practitioners that use different parts of the aquatic mammals for treatment (Izah & Seiyaboh, 2018). Forest ecosystems contain about three times the amount of carbon currently present in the atmosphere and about one-third of this carbon is stored above ground in trees and other vegetation and two-third is stored in the soil. The Oceans play a vital role in the global environment. Covering 70 per cent of the earth's surface, they influence global climate, food production and economic activities.

Despite these roles, coastal and marine environment are being rapidly. Demand for biochemicals and new pharmaceuticals is growing natural but new synthetic technologies compete with natural products to medicines, and meet the demand. For many other natural products (cosmetics, pharmaceuticals personal care, bioremediation, biomonitoring, ecological restoration), use is growing. Species extinction and over harvesting of medicinal plants is diminishing the availability of these resources Medicines: The use of natural products in the pharmaceutical industry

has tended to fluctuate widely, with a general decline in pharmaceutical bioprospecting by major companies (Millennium Assessment Organisation, 2005).

## 2.2. Empirical Review

### 2.2.1. Threatened Biodiversity and Health Security in Nigeria's Niger Delta

Viegas, *et al.* (2021) examined the nexus between investment in biodiversity protection and health gains. The study deconstructed health gains into human, animal, and plant health. The study engaged qualitative study approach with reliance on publications, textbooks, extant literature. Results from findings submitted that the loss for human health and well-being is linked with declining biodiversity through human activities on land and sea use changes; direct exploitation of organisms; climate change; pollution; and invasion of alien species. The study only focused on health security while this study extends to effects of threatened biodiversity on food security.

Millennium Assessment Organisation (2005) in an exploratory study investigated the links between human well-being and the ecosystem. Study was a qualitative compendium of ecosystem and humans well-being. Result from studies submitted that biochemicals, natural medicines, and pharmaceuticals of many medicines, biocides, food additives such as alginates, and biological materials are derived from ecosystems. Study concluded that most drugs were obtained from natural products. Even as approximately 50% of prescription medicines were originally discovered in plants since natural products still are actively used in drug exploration as medicinal plants continue to play an important role in health care systems in many parts of the world.

Subramanian and Payyappallimana (2020) investigated environment, biodiversity, and planetary health. The study was a qualitative study with secondary data driven from journals, textbooks and periodicals. Study submitted that degradation of the environment and loss of biodiversity are negatively affecting human health and well-being. Study opine that that environmental factors account for about one quarter of the global burden of diseases. Study zeroed on health security while this study considers both health security and food security.

### 2.2.2. Threatened Biodiversity and Food Security in Nigeria's Niger Delta

Jefferson *et al.* (2022) examined the safeguarding of seafood security, marine biodiversity and the Threatened Species. The study performed a spatial prioritisation of the ocean to protect biodiversity, threatened species and food security using Representative Biodiversity Areas on maps of 974 threatened species, and catch data for 2,170 exploited species. Results from analysis showed that multiple and competing objectives are achievable with minimal compromise. Protecting 30% of the ocean using a multi-objective solution could protect 89% of RBAs, 89% of threatened species and maintain access to fishing grounds that provide 89% of global catch. Study highlighted four exploited species for improved management, as they are consistently caught in areas of high conservation importance (skipjack tuna, *Katsuwonus pelamis*; yellowfin tuna, *Thunnus albacares*; Atlantic cod, *Gadus morhua*; Chilean jack mackerel, *Trachurus murphyi*). Study showed that a globally coordinated approach to marine conservation and food security is necessary, as regional scale strategies are shown to be less efficient and may result in conflict between food security and conservation objectives. Study was limited to food security while this works considers health security

Sufiyan (2022) employed desktop research design to interrogate contributions of biodiversity in food security. Study relied on extant literature, relevant secondary data and publications. Study submitted that biodiversity component; agro-biodiversity, animal biodiversity, Forest biodiversity, and microbial biodiversity are essential to world food security as all are sources of food. Study posited that terrestrial and aquatic animal biodiversity play an important role in increasing food security, breed improvement and source of gene for desired trait. Study did not captured environment security of which this study will consider.

Muluneh (2021) engaged qualitative research design to investigate the nexus between climate change on biodiversity and food security. Study employed qualitative research design with reliance on publications and extant literature. Findings emanating from study revealed that climate change aggravates in the negative food security in communities that depend on rain-fed agriculture since crops and plant and livestock thresholds for growth and yield are compromised. Study submitted that mitigating food waste, compensating food-insecure people conserving biodiversity, effective use of genetic resources, and traditional ecological knowledge could mitigate further biodiversity loss, and meet food security under climate change scenarios. Study was done in Kenyan and the need for similar study in Nigeria particularly in the Niger Delta cannot be overemphasized.

## 2.3. Theoretical Framework

### 2.3.1. The Frustration-Aggression Theory

The Frustration aggression theory was proposed by John Dollard, Neal Miller, Leonard Doob, Orval Mowrer, and Robert Sears in 1939. This theory is also known as the frustration-aggression-displacement theory. The thrust of the theory submits that a State or society is a reflection of the reaction it gets from the society, and that frustration precedes aggression (Sajid, 2019). Hence, aggression is a consequence of frustration. Frustration always creates a need to respond, and aggression can be one of its outcomes. It implies that frustration may or may not result in aggression, but aggression is possibly a result of frustration.

This theory is relevant to this study especially so because it attempts to explain insecurity of food from the erosion of biodiversity which could negatively aggravate the capacity of agricultural systems to adapt to changing conditions and shocks, even as climate change, could influence outbreaks of pests and diseases that may jeopardise food security and livelihoods. A threatened biodiversity from oil spillage, gas flaring also negatively impacted on agricultural yield and this could trigger frustrations and the Siamese twins of frustration is aggression which could be transmitted in different forms of expression. Instigation of aggression grows with every frustration in disadvantaged group, which ultimately leads to unlawful conducts and even violence which could have a long-lasting effect.

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## 3. Methodology

The methodology employed in this work is explorative due to the large stock of reliable literature available on the biodiversity discourse and the suitability of these resources to the discussion on the Niger-Delta eco-system. Content analysis was adopted. Data used in the work was gotten from World Bank, UN, and National Bureau of Statistics.

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## 4. Discussion

The study found out that human incursion on the ecosystem has a direct relationship with concerns of health security as rural dwellers, local health practitioners, and modern health production plants still rely on the ecosystem for a variety of their needs ranging from demand for biochemical, new synthetic technologies competing with natural products to medicines, demands for natural products for cosmetics, pharmaceuticals personal care. This shows that there is need for bioremediation, bio-monitoring and ecological restoration. This study agrees with the earlier works Viegas, *et al.* (2021); Subramanian and Payyappallimana (2020); Mililenium Assessment Organisation (2005).

Results from empirical analysis shows that there is a connection between threatened biodiversity and food insecurities. This could be explained that man depends largely on the ecosystem and the more threatened the biodiversity is the more threatened man food security is. There are rare fishes and plants whose nutritional values can be extensively ensured through conservations and can still provide humans food chains. This findings align with the earlier submission made by Jefferson *et al.* (2022); Sufiyan (2022); Muluneh (2021) whose studies

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## 5. Conclusion and Recommendations

The study concludes that human activities are the greatest threat to bio-diversity in the Niger-Delta eco-system in the 21<sup>st</sup> century. Also, that these human activities have direct root on eminent human insecurities arising from the need for survival which is much more threatening among the rural dweller. This is so because; the population of the rural poor constitutes the majority of the Nigerian population. Unfortunately, the endangered species which are gradually going extinct, both of animals and plants especially, have no hiding place as these rural dwellers keep hunting daily. Mangroves, lowland rainforest and freshwater forest ecosystems of the Niger Delta which is essential for the survival of several families of plants and animals under intense threat due to human activities in the region.

This study showed that lowland rainforest is the major ecosystem being loss. The loss of ecosystem due to human activities is a threat to the ecological role of the Niger Delta forest including protection of shoreline, breeding ground for several migratory birds, spawning group to both shell and fin fish, habitats to several endemic wildlife. Hence there is the need for improved enforcement, surveillance of the various the international legislations/ law/ treaties concerning the protection and conservation of biodiversity in which Nigeria is part of, as well as national and local law promoting biodiversity conservation.

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## Compliance with ethical standards

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No conflict of interest.

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