International Journal of Science Academic Research
Vol. 02, Issue 10, pp.3068-3075, October, 2021
Available online at http://www.scienceijsar.com

ISSN: 2582-6425

Research Article

EFFECTS OF MAN'S ACTIVITIES ON THE NATURAL ECOSYSTEM AND BIOTECHNOLOGICAL SOLUTIONS: A CASE STUDY OF UDESHI VILLAGE, OBANLIKU LOCAL GOVERNMENT AREA (L.G.A), CROSS RIVER STATE – NIGERIA

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Received 18th August 2021; **Accepted** 15th September 2021; **Published online** 30th October 2021

Abstract

Studies on the Effects of Man's Activities on the Natural Ecosystem and Biotechnological Solutions in restoring the ecosystem have been conducted. The Obanliku L.G.A of Cross River State, Nigeria, was chosen for the study because of its unique ecology, and practical demonstration of ignorance of the people in the region, in dealing with the ecological systems. The study shows that bush burning is a common practice of the people as a clearing strategy for agricultural purposes, and very often the wild fire goes beyond the farmers' control destroying the ecosystem, and gases such as carbon dioxide, carbon monoxide are emitted into the environment. These gases destroy the ozone layer which protects the environment, plants and animals from the direct effects of the sun. Fishing activities on river 'Orieh,'(a meandering river that stretches over 60km and empties into the Atlantic ocean), is done with the unprofessional method of using chemicals such as gamelin 20, vitox 85, and aldrin powder, that result to massive death of aquatic organisms and ignorantly to enhance harvest of the aquatic animals. Deforestation for: timber, domestic energy, agricultural and constructional purposes is done without control, resulting to loss of endanger species, properties, global warming, with its associated sea level rise and flooding due to melting of the polar ice. Waste from agricultural activities, plastics, electronic devices, human waste (faeces) and oil spills resulting from subsurface exploitation and exploration failures, activities of vandals and transportation accidents have devastating consequences on the environment and human health. Mechanical clearing of farm lands should be encouraged as the biomas derived from clearing can be used for generating bio-energy and environmentally friendly fertilizers as compared to the inorganic fertilizer. Selective fishing strategies should be adopted, such as the use of nets, where the young fishes are returned back to the river. Government should put enabling laws in place to guide the extinction of endangered flora and fauna. Plants are known to be totipotent, thus, biotechnology is the ultimate solution to: Aggressive Reforestation and aforestation, organic waste recycling technologies, such as the generation of bio-energy from the biomass, the use of deoxyribonucleic acid (DNA) bar-coding to guard against illegal exploitation of game reserves, like transformed elephant tusk, genetic engineering to produce drought and disease resistant hybrid that will withstand adverse environmental conditions, and bio-sensors that will dictate areas that have been contaminated with crude oil spills. Regular medical checkup on the people and environmental awareness programs should be done in schools and religious gatherings. Indicators of a depleted environment includes the following: Global temperature rise, flooding, poor air quality, poor ground water quality, poor soil fertility, outbreaks of epidemics and pandemics, extinction of flora and fauna.

Keywords: Ecology, Environment, Deforestation, Reforestation, Bush Burning, Flood.

INTRODUCTION

Man's activities on the environment over time such as deforestation, pollution, agriculture, mining, construction of engineering structures, oil exploitation, inappropriate fishing methods, hunting etc, have resulted to serious environmental degradation such as global warming, climate change, loss of fauna and flora, ecological collapse, etc, which pose serious risk to man and other elements within the ecosystem. According to Mary (2018), an ecosystem is a self-sustaining system of community made up of biotic and abiotic components interacting with each other.

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And the study of ecosystems mainly consists of the study of certain processes that link the living (biotic) components to the non-living (abiotic) components. An ecosystem could also be understood as a biological community made up of population of plants, animals, microorganisms and man (Billings, 1983). The concept of ecosystem was coined in 1935 by Sir Arthur Tansley, to recognize the integration of the biotic community and its physical environment as a fundamental unit of ecology within a hierarchy of physical systems that span the range from atoms to universe. Shortly thereafter, Lindman's 1942 study of energy flow through an aquatic ecosystem introduced the modern concept of an ecosystem by demonstrating that exchange of energy and matter between biotic and abiotic pools make a community inseparable from its environment (Schowalter, 2011). As human population increases, the effects

of human activities on the ecosystem including water, air, land and the life that we share in the world are almost immeasurable (Weedmark, 2018). Human impact on the environment has become one of the main issues of concern all over the world, and the need to be aware of these factors that lead to environmental degradation and the desermination of such information has become important (Alexander, 2020). The impacts from human activities on land and water can influence ecosystems profoundly. Climate change, ocean acidification, habitat loss, eutrophication, pollution, contaminants and invasive species are some of the problems facing ecosystems. The cumulative effects of these problems as well as numerous other pressures can have serious impacts on ecosystem function (Statistic Canada, 2013). The effects of these man's activities have resulted to serious environmental degradation, which according to United Nations International Strategy for Disaster Reduction – ISDR (2004), is the reduction of the capacity of the environment to meet social and ecological objectives and needs. According to Johnson *et al,* (1997), environmental degradation is any change or disturbance to the environment, land, or soil perceived to be deleterious or undesirable.

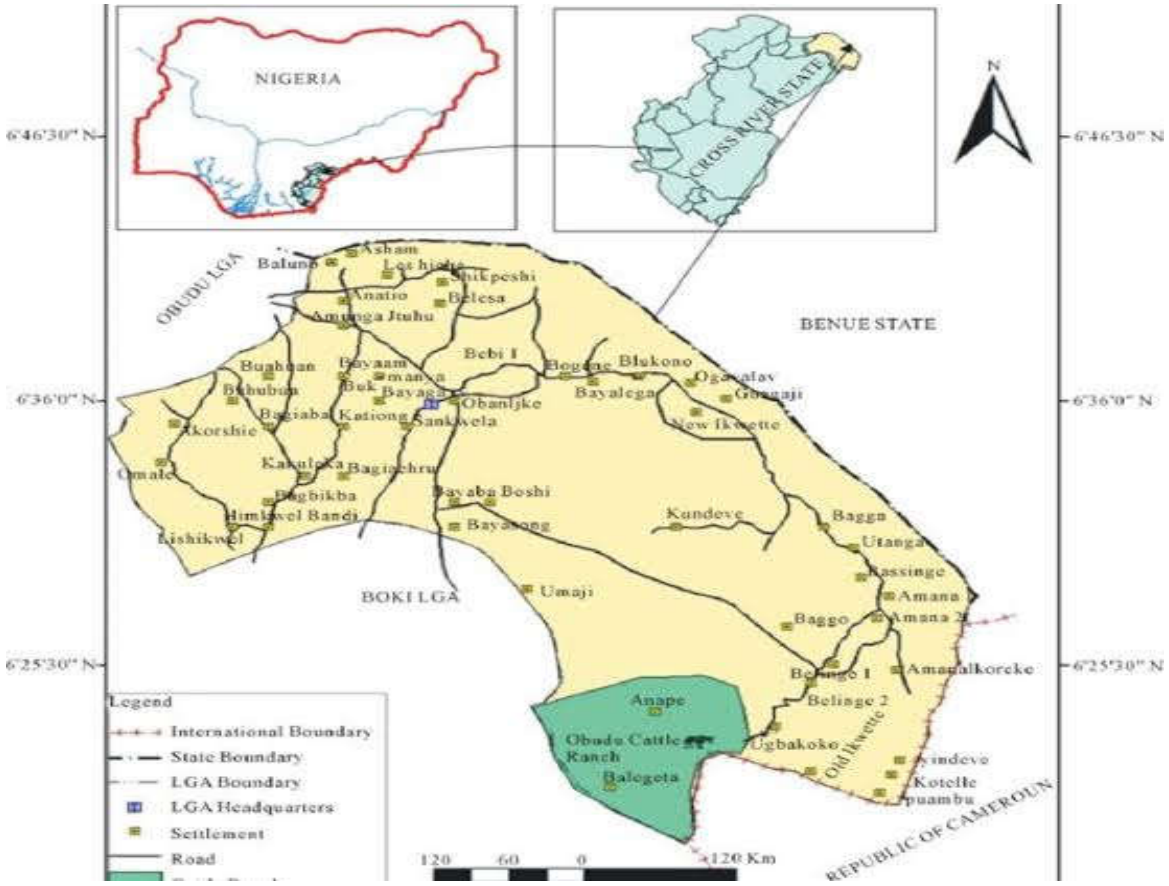
One of the effects of man's activities in an ecosystem is pollution, though not a new phenomenon, yet it is among the world's problems facing humanity. Man's activities as a result of urbanization, industrialization, mining and exploration are at the forefront of global environmental pollution. And despite global attention towards pollution, the impact is still being felt as a result of its severe long-term consequences (Ukaogo *et al.,* 2020). Whereas, pollution can be caused by natural events such as forest fires and active volcanoes, the use of the word 'pollution' generally implies that the contaminants have an anthropogenic source, that is, a source created by human activities. Hence, pollution is the introduction of harmful substances either in form of solid, liquid or gas, or any form of energy such as heat, sound, or radioactivity to the environment. These include air pollution, land, water, noise etc. Pollution of all kinds have negative effects on the environment and wildlife and often impacts human health and wellbeing. By the middle of the 20th century, an awareness of the need to protect air, water, and land environments from pollution had developed among the general public. In particular the publication in 1962 of Rachael Carson's book "Silent Spring," focused attention on environmental damage caused by improper use of pesticides such as DDT and other persistent chemicals that accumulate in the food chain and disrupt the natural balance of the ecosystem on a wide scale. Unfortunately, attempt at pollution control are often surpassed by the scale of the problem (Nathanson, 2010).

According to Manisalidis *et al* (2020), one of our era's greatest scourges is air pollution, not only of its impact on climate change but also its impact on public health and individual health due to increasing morbidity and mortality. There are many pollutants that are major factors in disease in humans, which include Particulate Matter (PM), particles of variables, but very small diameter penetrate the respiratory system through inhalation, causing respiratory and cardiovascular diseases, reproductive and central nervous system dysfunction, cancer, etc. Furthermore, nitrogen oxide, sulfur dioxide, volatile organic compounds (VOCs), doxins, and Polycyclic Aromatic Hydrocarborns (PAHs) are all considered air pollutants that are harmful to humans. Carbon monoxide can even provoke direct poisoning when breathed in at high levels. Heavy metals such as lead, when absorbed into the human body can lead to direct poisoning or chronic intoxication, depending on exposure. And diseases occurring from the above mentioned substances include principally respiratory problems such as Chronic Obstructive Pulmonary Disease (COPD), asthma, bronchiolitis, lung cancer, cardiovascular events, central nervous system dysfunction (Manisalidis *et al* (2020).

According to Begum (2019), ecosystems, the fabrics of life on which we all depend are declining rapidly because of human actions. Human pressure on nature has soared since the 1970s, and we have been using more and more natural resources and this has come at a cost. If we loosed large portions of the natural world, human quality of life will be severely reduced and the lives of the future generation will be threatened unless effective action is taken. Noor (2021), further pointed out that only about 3% of land on earth still qualifies as 'ecologically intact,' with undisturbed habitats and healthy populations of its original animal species due to human activities. In the views of Michelle (2017), humans rely on the ecosystem to supply food and other necessities for a healthy human life. And certain human activities have had a devastating impact on ecosystems; from pollution to overharvesting, the damage and exploitation of wildlife and natural vegetation by humans have left some ecosystems in bad shape. For example, burning of coal to produce energy, releases chemicals like sulfur dioxide. Such chemicals in the air lead to acid rain and acid deposition, which can harm plant and animal life especially as it acidifies aquatic ecosystems. Also liquid chemicals runoff from human activities can also negatively impact the ecosystems. Such runoff water is not just produced by big industrial factories. Zinc and lead for example runoff from lawns, driveways and sidewalks in residential areas can damage ecosystem. According to Watts (2019), human society is in jeopardy from the accelerating decline of the earth's natural life-support systems. Cresswell (2012), further noted that the integrity of the earth's ecosystem is essential for human well-being, providing services such as climate regulation and water purification. And the collective ecological footprint of humanity is continuing to increase, and has already outstripped the carrying capacity of planate earth. This increase is driven by population growth and unsustainable rate of consumption. Both of these issues need to be addressed if we are to reverse the damage currently being inflicted on our vital ecosystem. This paper therefore seeks to investigate how human activities affect the natural ecosystem; to identify indices of a depleted environment; and to proffer solutions to some these practices that affect the natural ecosystem.

Area of the study

Obanliku is a Local Government Area in Cross River State, Nigeria, with its headquarters in Sankwala. It is located in the Northern Senatoral District of Cross River State, and made up of ten (10) wards. It is located within the urban hills, and prominent among the hills is the 'Obudu Cattle Ranch', with a height of 5630ft above sea level. It is surrounded by different streams, with both inter-state and international boundaries. It is bounded in the north by Kwande Local Government Area of Benue State, in the East by the Republic of Cameroon, West by Obudu L.G.A, and in the South by Boki L.G.A in Cross River State. It is located in latitude 6^{o} 36'23N and longitude 9^{o}15'7E, and has an area of 1,057km^{2} and a population of about 110,324 as at 2006 census.



Source: K. I. Ofem (2021), "Physiochemical Characteristics, Degradation Rate and Vulnerability Potential of Obudu Cattle Ranch Soils in South-East Nigeria." (Map of Cross River State Showing Obanliku Local Government Area). Available in https://www.researchgate.net/figure/map/of-cross-rivers-state-showing-obanliku-local-government-area. Accessed 25/06/2021.

Fig. 1.Map of Nigeria showing Cross River State and Obanliku Local Government Area

Human activities that affects the natural ecosystem

Subsurface Drilling Activities: Subsurface drilling activities either for water, hydrocarbon, or solid minerals, have destroyed the natural existing aquifers and heavy metals deposits. An aquifer with significant lateral extent, may be exposed due to man's activities in constructing soakaways for human waste, and the same aquifer is a source of drinking water for a home or community, so that there is hydro-communication of the aquifer with human waste. The effects of this setting, is the outbreak of diseases to the users of such water for drinking and domestic purposes. For water to be used for drinking and domestic purposes, adequate biochemical test for coaliform count be properly conducted and the water ionic contents in line with the recommendations of World Standard Organization (WHO).

Hunting: Hunting is the process of going after and killing of wild animals and birds as a sport of for food (Joana *et al., 1948* - Oxford Learner's Dictionary). According to Rinkesh (2021), overhunting is an activity that results in a serious reduction of species population or harm to wildlife. It is otherwise defined as the relentless chase for wild or game animals to kill or catch them for economic or personal gains or food. According to Zuidema (2016), overhunting occurs when more animals are caught than what the population can replace and this leads to degradation of an ecosystem. Accordingly, overfishing and over hunting eliminates certain species of animals that are crucial to an ecosystem. According to Nelson (2020), numerous species have been wiped out primarily by human hunters in the last few hundred years; from marine life to birds and mammals. And among the animals that have been hunted to extinction include: Tasmanian Tiger, Passenger pigeon, Great auk, Quagga, Falkland Island Wolf, Zanzibar Leopard, Caribbean Monk Seal, Carilina Parakeet, Atlas bear, Toolache Wallaby, Sea mink, Bubal hartebeest, Steller's sea cow, etc. According to Gross (2019), unsustainable hunting of animals on land, in water and in the air has already skewed the size of distribution of biodiversity and is set to continue disrupting the entire ecosystem. Accordingly, compare with the invisible and inadvertent damage caused by agriculture, the direct killing of animals appears even more reckless and indefensible, and yet it carries on unabated around the globe, on land as well as in the oceans and in the air.

Pollution: Pollution is the introduction of harmful materials (pollutants) into the environment. Pollutants can be natural, such as volcanic ash; and can also be created by human activity, such as trash or runoff produced by factories. Pollutants damage the quality of air, water, and land (National Geographic Society, 2021). According to Bradford (2019), pollution is the process whereby land, water, air or other parts of the environment become unsuitable for use as a result of introduction of contaminants into the environment. According to Kwak (2019), man-made pollutants can threaten human health and compromise the natural ecosystem and environment. These pollutants are generally byproduct of human actions such as consumption, waste disposal, industrial production, transportation, energy generation, etc. Similarly, Ityavyar & Thomas (2020), noted that environmental problems

in Nigeria generally are many, diverse in nature and are caused by man's interaction with the environment for exploits in a number of ways, both in the cities where industrial activities predominate and rural areas where agriculture thrives. And man utilizes the air for survival, harness land and water for domestic, commercial, industrial, agricultural and other purposes. Through these activities, man directly and indirectly create problems which are detrimental to his health, natural existence and stability. These problems are consequences of environmental pollution which also degenerate to environmental degradation and several other hazards such as widespread epidemics, depletion of natural habitat, etc. Pollution can be on land, air, and or water:

Land Pollution

Land pollution is the deposition of solid or liquid waste materials on land or underground in a manner that can contaminate the soil and ground water, threaten public health, and cause unsightly conditions and nuisance (Nathanson, 2017). It could also refer to any damage, degradation or loss cause to the land (Woodford, 2020). It also refers to the deterioration of the earth's land surfaces, at and below ground level. And the cause is the accumulation of solid and liquid waste materials that can also contaminate groundwater and soil. These waste materials are often referred to as municipal solid waste (MSW), which includes both hazardous and non-hazardous waste (Texas Disposal system, 2020). Accordingly, there are many different ways of polluting the land, from soil contamination (poison by chemicals or waste) to general urbanization (the systematic creation of cities and other human settlement from greenfield, virgin-land), huge landfills, etc. Some of the ways land pollution occurs include:

Poor waste/Garbage disposal: Poor waste disposal is one of the common causes of land pollution. According to Ejaz, *et al,* 2010), solid waste dumps are seriously damaging the environmental conditions in developing countries. And negative environmental impact from improper solid waste dump can be easily observed in the developing world, which creates serious negative environmental impact. According to Ogundele *et al., (2018*), the generation of waste and its disposal, collection, transport and processing are important for healthy ecosystem and health of people. The negative health effects of poor waste management include cancer, congenital malformations, etc. According to the Metropolitan Transfer Station (2017), negative effects of improper waste management do not only end in a disgusting view but also affects the overall economy of a country. For example, States will have to spend a lot of money to counter the effects of improper waste management. And contamination occurs by spilling and burying hazardous components in the soil. Animals depending on the environment also face great threat due to the oil spills and leaching of chemicals which directly cause soil and water contamination. And burning of any disposed waste and plastic materials can also result to air and environmental pollution. Harmful greenhouse gases are created from decomposing waste. These rise up to the atmosphere and trap heat. This adversely causes extreme weather reactions in form of storms and typhoon. Open defecation and uncontrolled pit toilets also contribute greatly to land pollution.

Mining Activities: Mining activities though inevitable for economic development, are environmentally hazardous and results in drastic disturbance of the land, which includes heavy metal toxicity and acidity. During mining operations, overburden materials are removed and dumped in haphazard manner. This is highly prone to erosion and causes contamination of rivers and adjoining agricultural lands when harmful substances leached out from it through the rain water. Also ecosystem disruption by mining results in increase nutrient export from the system and depletion of soil carbon pool. Mining also alters the flow of nitrogen through a stable soil-plant-microbial ecosystem. It also cause loss of litter layer, which is an integral storage exchange site for nutrients (Singh, 2018) According to Sheth (2018), mining has an adverse effect on soil quality. It also contributes to deforestation and loss of fauna and flora. In case of coal mining if not done properly, it may lead to the production of greenhouse gases and coal dust in the air. Pollutants buried are released to the environment creating severs environmental pollution. Also toxic chemicals and acidic water are found during and after mining which lead to contamination of the environment. According to Kassahun (2018), the forests that are cleared for mining purposes are home to a large number of organisms. Indiscriminate clearing of forest leads to loss of habitat of a large number of animals. And this puts the survival of a large number of species at stake. In wilderness areas, mining may cause destruction and disturbance of ecosystems and habitats, and in areas of farming, it destroys productive grazing and croplands. And despite measures being taken to release the chemical waste into nearby rivers through pipes, a large amount of chemicals still leak out into the land. This changes the chemical composition of the land and makes it unsuitable for agricultural activities.

Agricultural Activities: Agricultural activities over the years contribute seriously to land pollution and the environment. According to the Food and Agricultural Organization of the United Nations –FAO (2018), agriculture and livestock activities pollute the soil through excessive application of pesticides and fertilizers; the use of manure and sewage sludge with high antibiotic, antimicrobial-resistant bacteria and heavy metal content. Soil pollution causes a chain reaction that starts with reduced soil biodiversity, alters organic matter incorporation rates, and then weakens soil structure and ability to resist erosion. According to Lindwall (2019), nitrogen-based fertilizers produce potent greenhouse gases and can overload water ways with dangerous pollutants, and chemicals pesticides with varying toxicological effects which can contaminate our air, water or food. Bush burning has also resulted to land pollution and the environment. Bush burning is the removal of the natural vegetation cover that protects the soil surface through the use of fire. And this exposes the land to the effects of wind, water erosion and ultraviolet radiation (Yakubu *et al.,* 2019). According to Izah *et al.* (2017), biodiversity including plants, animals and microbes have several economic importance to human and its ecosystem. Unfortunately, the intensity of bush burning in the Niger Delta region of Nigeria has increased, which is among the leading causes of decline in composition and abundance of biodiversity. Similarly, Hamid *et al.* (2010), pointed out that bush burning does not only pose health hazard to man alone but also affects the environment in general through the emission of different pollutants. Particulate, carbon monoxide, hydrocarbons, sulfur, etc, are some of the pollutants of bush burning, and they all have various effects on man and his environment, like reduction of visibility by particulate matters and respiratory diseases. Apart from soil destruction and desert

encroachment caused by bush burning, it has also had a marked increase in global warming due to emission of NO_2, SO_2, SO_3, NO, CO, and CO_2 gases which have tremendous effects on the ozone layer (the ozone layer prevent Ultraviolent Radiation from reaching the earth's surface). According to Sanyaolu (2015), the effects of bush burning in rural livelihoods and on the ecosystem is becoming increasingly extensive and damaging. For example, it leads to decrease in biodiversity population density of herbaceous species and loss of organic matter in soil. This therefore suggests that there is a need for an increase understanding of the causes and effects of bush burning in our ecosystem. Similarly, Ayotunde-Salami (2018), observed that most times, the intensions of the individuals involved in bush burning are good, but they are unaware of the damage caused to the crops, trees and animals in the environment. This is a common act among farmers as they use this medium to clear their farmlands.

Chemicals from factories/Industries: Industrial pollution is characterized as pollution that originates from industry. It is one of the most common pollution around the world. Long-term exposure to contaminated air and water leads to chronic health issues, rendering industrial emissions a serious concern. It also degrades the air quality in the surrounding areas, resulting to a number of respiratory problems. Industrial operations are a significant cause of pollutant in the air, water and soil, resulting in sickness and death (Adhvaitha, 2021). According to Behera & Reddy (2002), Industrial pollution has been one of the factors causing water pollution. Industries release into the water effluents containing chemicals and biological matter that impose high demands on the oxygen in the water. Industrial wastes contain chemicals and heavy metals such as arsenic, lead, mercury, cadmium and zinc, which are harmful to human health and the ecosystem. Heavy concentration of chemicals and metals in both surface and ground water bodies cause serious damage to the ecology of rivers system.

Water Pollution

Water pollution is one of the environmental challenges in our ecosystem. Water pollution occurs when harmful substances, often chemicals or microorganism contaminate a stream, river, lake, ocean, aquifer, or other body of water, degrading water quality and rendering it toxic to humans or the environment (Denchak, 2018). According to Nathanson (2020), water pollution is the release of substances into the surface groundwater or into lakes, streams, rivers, and oceans to the point where the substances interfere with beneficial use of the water or with natural functioning of the ecosystems. Accordingly, there are many different ways of polluting the land, from soil contamination (poison by chemicals or waste) to general urbanization (the systematic creation of cities and other human settlement from greenfield and virgin-land), huge landfills, etc (Chris Woodford, 2020).

According to Solar Impulse Foundation (2021), human activity is primarily responsible for water pollution, even though natural phenomenon such as landslides and floods can also contribute to degrade the water quality. And the two types of water pollution according to them include: organic Pollution due to microorganisms, bacteria and viruses, present in the water, generated by excrement, animal and vegetable waste; and chemical pollution generated by the nitrate and phosphate of pesticides, human and animal drugs, household products, heavy metals, acids and hydrocarbons used in industries. Accordingly, agriculture has an impact on water pollution due to the use of chemicals such as fertilizers, pesticides, fungicides, herbicides or insecticides as well as livestock excrement, which are washed into the water bodies, with effects on the aquatic ecosystem. According to Espinoza (2014), over the last hundred years, humans have introduced chemicals into the environment. The improper handling of chemicals waste has resulted to water pollution. Two-third of aquatic life is considered to be an endangered species as a result of improperly disposed chemicals and other waste. When a toxic waste harms an organism, it can end up destroying an entire food chain of aquatic life. Improperly disposed chemicals pollute marine life and kill sea mammals, corals, and fish, etc. Some of the ways in which water can also be polluted include according to Nathanson (2020) include:

Domestic sewage: Domestic sewage is the primary source of pathogens (disease-causing microorganisms) and putrescible organic substances. Because pathogens are excreted in feces, all sewage from cities and towns is likely to contain pathogens of some type, potentially presenting a direct threat to public health. As organics are decomposed naturally in the sewage by bacteria and other microorganisms, the dissolved oxygen content of the water is depleted. This endangers the quality of lakes and streams, where high levels of oxygen are required for fish and other aquatic organisms to survive. Sewage-treatment processes reduce the levels of pathogens and organics in wastewater, but they do not eliminate them completely.

Toxic waste: Waste is considered toxic if it is poisonous, radioactive, explosive, carcinogenic (causing cancer), mutagenic (causing damage to chromosomes), teratogenic (causing birth defects), or bioaccumulative (that is, increasing in concentration at the higher ends of food chains). Sources of toxic chemicals include improperly disposed wastewater from industrial plants and chemical process facilities (lead, mercury, chromium) as well as surface runoff containing pesticides used on agricultural areas. This toxic waste can be washed into the water body, thereby affecting the aquatic ecosystem.

Sediment: Sediment (e.g., silt) resulting from soil erosion can be carried into water bodies by surface runoff. Suspended sediment interferes with the penetration of sunlight and upsets the ecological balance of a body of water. Also, it can disrupt the reproductive cycles of fish and other forms of life, and when it settles out of suspension it can smother bottom-dwelling organisms.

Thermal pollution: Heat is considered to be a water pollutant because it decreases the capacity of water to hold dissolved oxygen in solution, and it increases the rate of metabolism of fish. Valuable species of game fish (e.g., trout) cannot survive in water with very low levels of dissolved oxygen. A major source of heat is the practice of discharging cooling water from power plants into rivers; the discharged water may be as much as 15 °C (27 °F) warmer than the naturally occurring water.

Petroleum (oil) pollution: Petroleum (oil) pollution occurs when oil from roads and parking lots is carried in surface runoff into water bodies. Accidental oil spills are also a source of oil pollution, as in the devastating spills. Oil slicks eventually move toward shore, harming aquatic life and damaging recreation areas.

Groundwater and oceans: Water contained in underground geologic formations called aquifers, is a source of drinking water for many people. Although groundwater may appear crystal clear (due to the natural filtration that occurs as it flows slowly through layers of soil), it may still be polluted by dissolved chemicals and by bacteria and viruses. Sources of chemical contaminants include poorly designed or poorly maintained subsurface sewage-disposal systems (e.g., septic tanks), industrial wastes disposed of in improperly lined or unlined landfills or lagoons, leachates from unlined municipal refuse landfills, mining and petroleum production, and leaking underground storage tanks below gasoline service stations. In coastal areas, increasing withdrawal of groundwater (due to urbanization and industrialization) can cause saltwater intrusion: as the water table drops, seawater is drawn into wells.

Air Pollution

Air Pollution refers to the release of pollutants into the air which are detrimental to human health and the planet as a whole (Mackenzie & Turrentine, 2021). According to Massachusetts Department of Environmental Protection (2021) air pollution can cause a variety of environmental effects.

Indicators of a depleted environment

a. Flooding
b. Global temperature rise
c. Poor air quality
d. Out break of epidamics and pandamics
e. Poor agricultural yield
f. poor health conditions, such as:
    i. Stomach disorder/indigestion
    ii. Cancer/Tumors
    iii. Blindness
    iv. Miscarriages
    v. Skin infection
    vi. mutation
    vii. Organ failure, etc.
    viii. Fever
    ix. Hemorrhage
    x. Headache, etc.
g. Poor soil fertility
h. Extinction of certain flora and fauna species in the environment
i. Air, land and water pollution
j. Sea level rise
k. Global warming
l. Desertification

DISCUSSIONS AND FINDINGS

Udeshi village, in Obanliku Local Government Area, Cross River State, Nigeria, belongs to the tropical rainforest zone with average rainfall of 1300-3000mm to support the vegetation. The high rate of uncontrolled lumbering, for house furniture, schools, domestic energy, etc, has to a large extent, depleted the environment. The unprofessional method of using chemicals to harvest aquatic animals has led to the extinction of aquatic animals. The practice of bush burning as farmland clearing strategy, has not only contributed to increase emission of greenhouse gases such as CO_2, Co, but has resulted to damage of ground biotic components, lives and properties.

Solutions to a depleted environment

a. Mitigative Solutions

i. Deforestation should be well monitored with strict reforestation programs
ii. The use of chemicals as a fishing technique should be condemned
iii. Bush burning as a farming practice should be replaced with clearing, and the organic matter from that clearing should be used as fertilizer.
iv. Efficient management of biodegradable and non-biodegradable waste. Incineration of waste should be avoided and be replaced with recycling technologies such as the use of bioreactors, pyrolysis, etc; and gasification should be encouraged.
v. The use of fossil fuels for energy generation should be discouraged.
vi. Highly contaminated fungicides for pest control should be replaced with the use of pest, worms, and bacteria bacterial resistant crops.
vii. Effort on the preservation of endangered plants and animal species should be promoted
viii. Mining activities should be done based on global best practices technologies.

b. Adaptive Strategies

i. Bioremediation programs on land and aquatic environment should be encouraged
ii. Regular soil and aquatic environments frequently in contact with human activities should be tested and analysed
iii. The importance of regular physical exercise should be emphasized with high level of hygiene
iv. Reforestation programs should be encouraged.

c. Biotechnological solutions

- Aggressive reforestation (to restore the loss ecosystem) and aforestation (to create new ecosystem)
- Organic waste recycling technologies, such as the generation of bio-energy from the biomass, using the biodigester, shall reduce much dependence on fossil fuel
- The use of deoxyribonucleic acid (DNA) in bar-coding to guard against illegal exploitation of game reserves, like transformed elephant tusk is a security strategy that will help to conserve most endangered species.
- Genetic engineering to produce drought and disease resistant hybrid that will withstand adverse environmental conditions
- Bio-sensors that will dictate areas that have been contaminated with crude oil spills for quick atension.
- Phytoremediation (the use of plants) in remediating a heavy metal contaminated soils in mining areas

Conclusion

Human activities over time have directly and indirectly affected the ecosystem, which has led to serious environmental degradation causing negative impacts on man, environment, plants and animals. Activities such as bush burning, hunting, agriculture, deforestation, burning of fossil fuel, etc have negatively affected the ecosystem. Hence, government regulation and massive awareness campaign should be introduced and enforced to contend this menace. The

environment is rapidly degrading, and so implementing: The adaptive, mitigative and biotechnological solutions shall help restore the loss glories in the environment.

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