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ARTICLE

Deforestation and Habitat Loss: Human Causes, Consequences and Possible Solutions

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ABSTRACT

Deforestation leads to habitat loss while preservation and conservation of the natural forest increase biological diversity. Multiple factors have been reported to be responsible for deforestation and habitat loss, which could either be of human or natural origin. Natural causes of deforestation could be as a result of forest fires, droughts, exotic animals, floods, overpopulation of foreign animals and climate change. That notwithstanding, human activities are among the principal causes of global deforestation and habitat loss with agricultural expansion, cattle breeding, timber extraction, mining, oil extraction, dam construction and infrastructure development as some examples of these human influences. This study identifies agricultural activities and urbanization as the chief causes of human induced deforestation and habitat loss on a large scale. The simple and more practicable approach to curb the already alarming effects of deforestation and habitat loss is through *environmental education* of everyone still surviving on our planet. Environmental education is the key to reversing continuous and deliberate human actions through the protection of every natural forest and afforestation where necessary.

1. Introduction

Deforestation leads to habitat loss while preservation and conservation of the natural forest increase biological diversity. Through the biological diversity of the natural forest the basis for life on earth and it is a *sure means* of securing the abundance of the earth for people of the future. In essence, by conserving the forest, we do not just guarantee the survival of several other habitats but also the survival of the human environment. In the long run, we can have food security, improved agriculture, recreational pursuits and other derive benefits through different the varieties of life that the forest houses by conserving the different characteristic elements and the biological diversity of the forest [23]. Biological diversity is the assurance we need for healthy living presently and in the future as the entire scope of the uncommonly rich and assorted biological legacy of the tropical areas is presently in danger. The reasons why the issue of deforestation and habitat loss should be seen as global concern and given urgent attention are so many; some of which are the exploding human population, the continuous scientific advancement of new uses for biological diversity and currently the extinction or the gradual disappearance of some rare plants and

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animals. Despite this alarming circumstances, some countries of the world are still destroying the forest in their surroundings, especially the ones with high income. The poor countries of the world have relatively low rates of deforestation because their available income is limited in carrying out large scale exploitation in their environment; and as the incomes of these countries rises, more lands are being deforested for the purposes of development [23].

Mankind in a journey to build up the Earth's surface and change the common environment has annihilated the majority of the world's defensive cover from the outside hurtful gases. This cycle isn't new—it has been continuous for centuries—however it has quickened forcefully in the course of the last two centuries, and particularly over the most recent few years [20]. The forest system of the world has been destroyed, demolished, and felled by cutting tools, until just little pieces of their unique degree endure. Forested areas have been hit particularly hard in a way that the forested areas of the world have been diminished by generally half in the course of recent hundreds of years. Clearing land for farming and development is a significant reason for environment destruction. Within the last 100 years, the measure of land utilized for farming has nearly multiplied [20]. Land utilized for cattle grazing has dramatically increased. Agribusiness alone has cost the United States half of its wetlands and practically the entirety of its tall grass grasslands.

Scholars have concentrated on tropical jungles, for two basic reasons. To start with, despite the fact that these habitats cover just 7% of the Earth's territory surface, they contain the greater percentage of the species in the whole world biota. Secondly, most of the forested areas are will likely vanish inside the following century, taking with them a huge number of animal categories into eradication. Many have assumed that the speed of extinction currently may even be faster than it did in the 1800. How sad will the world be, to observe the passing of the last member of a particular species? With the current rate of deforestation, that possibility is now happening. The forests need protection as well as the lives in it, to promote our own survival on earth. This study focuses on the influences on human actions on our forest; the impact deforestation has on our environment, and the possible solutions to avert deforestation and habitat loss using secondary data such as scholastic publications, newsletters, documentaries and other related articles.

2. Conceptual Clarifications

2.1 Deforestation

Deforestation can be defined comprehensively to incorporate the change or conversion of a natural forest to a non-forest for purposes of agricultural services and development [28]. In a nutshell, we can conclude that deforestation simply means the permanent transition from forest to all other land uses.

About half (47 percent) of Earth's forest front of over 8,000 years have gone into extinction as a result of human action [1]. Despite the above unfortunate incident, above 25 percent of the earth surface is still covered with forest or 3.5 million hectares (ha). 55 percent are situated in developing nations, fundamentally in the tropical world. According to Angelsen [1], from 1980 to 1995, the developing nations lost around 200 million ha (10%) of their forested areas, while developed nations extended their forested areas to around 20 million ha.

2.1.1 Forest Degradation

Forest degradation is a process which negatively affects the structural and functional characteristics of a forest. Forest degradation usually results from human activities, which are greatly influenced by the variety of macroeconomic, demographic, technological, institutional and political factors. The degradation of the forest do not happen suddenly (like an earthquake) but a gradual process, that may take a long period before it is visibly ascertained, implying that the forest degrades over time [27]. The gradual degradation of the forest can also occur due to increased disturbance resulting in loss of forest products or the reduction of forest quality - the thickness and structure of the trees, the biological administrations that provided the biomass of plants and animals, the species variety and the hereditary variety. When the quality of the forest drops, the forest's biotic components may also be affected leading to reduction of the quality of the soil and water, and interactions between the individual components, ultimately affecting forest functioning and diminishing the provision of ecosystem goods and services. Man is solely responsible for forest degradation because of his unsustainable exploitation through excessive harvesting of forest products, overgrazing, wildfires, and the spread of invasive species or pests.

Figure 1. Massive clearing of the forest for developmental purposes.

Source: Derouin [19].

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2.1.2 Forest Fragmentation

Forest fragmentation is the breaking of enormous, adjoining, forested regions into more modest bits of forest; ordinarily these pieces are isolated by streets, farming activities, utility passageways, regions, or other human developmental projects. It ordinarily happens steadily, starting with clearing few portions of the forested lands for temporary or permanent human activity. After some time, those non-forested patches gradually extend into deeper part of the forest and continue to grow until most parts of the forest are affected, leading to the reduction in the quality, function and value of the remaining forest [10].

2.1.3 Afforestation

Afforestation is the transformation from other land uses into forest, or the expansion of the shelter cover over the 10% threshold. Afforestation is the converse of deforestation and incorporates territories that are effectively changed over from other land uses into forest through conscious human effort. For instance, consciously planting trees in an abandoned agricultural field will over time, transform such area to a forest. Afforestation also entails the natural transitions of non-forest areas into forest [10].

2.1.4 Reforestation

Reforestation is the re-enforcement of forest formations especially with a noticeable reduction in the number of individual trees, quality and value of the forest below 10% canopy cover due to the activities of the humans or natural disturbances[25]. According to Tejaswi [25], "*the definition of forest clearly states that forests under regeneration are considered as forests even if the canopy cover is temporarily below 10 per cent*". Thus, reforestation can be said to be planting more trees in places in the forest where the richness of the forest is seen to be depreciating or generally restoring a dying forest.

2.1.5 Forest Improvement

Forest improvement is simply increasing the richness (number of trees) or stocking within a forest to restore the forest to its full or former capacity and increase sustainable usage. Forest improvement can also be defined as the increase of canopy cover and/or stocking of the forest through growth [25]. Generally, forest improvement is the long-term increase of the overall potential supply of benefits from the forest, which incorporates biodiversity and every other product or services [25].

2.2 Habitat Loss

Habitat loss is the process by which a natural habitat becomes incapable of supporting its native species thereby leading to total or partial loss of the richness or biodiversity. Basically, three major types of habitat loss can be identified: habitat destruction, habitat degradation, and habitat fragmentation.

2.2.1 Habitat Destruction

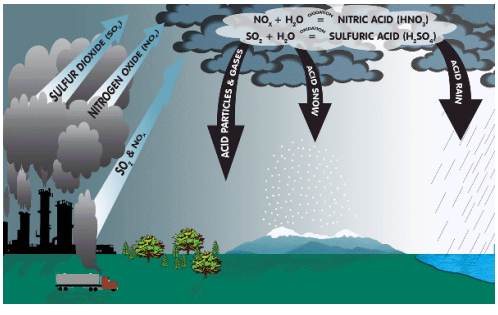
Figure 2. Jungle burned for agriculture in Southern Mexico. Source: Jami Dwyer [29].

Habitat destruction is the cycle in which natural habitat is harmed or wrecked so much that it is no longer capable of supporting the species and biological networks that normally happen there. This scenario brings about the elimination of species and, subsequently, the deficiency of biodiversity [28].

Most habitats are greatly destroyed directly by the numerous human activities, where a large portion land is usually cleared for farming, mining, logging, hydroelectric dams, and developmental structures [10,11]. Very unfortunately, it is reported that humans are currently destroying natural habitats at a rate and spatial extent that exceed the level of at which most species and communities can survive [28]. Aside from the human induced factors, habitat destruction can also be caused by natural circumstances like floods, volcanic eruptions, seismic tremors, and atmosphere variances [28].

Despite the fact that habitat destruction fundamentally causes species eradications, it can likewise open up new living space that may give a climate wherein new species can develop, in this manner exhibiting the versatility of life on Earth [11].

2.2.2 Habitat Degradation



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Habitat degradation is another outcome of human activities. The continual quest of humans to develop the environment has led to habitat degradation. The resultant effects of this human developmental agenda are environmental contamination, climate change, and the introduction of obtrusive species, and general reduction in the quality of the environment, making it hard for local plants and creatures to flourish [28].

Of the factors that are aiding habitat degradation is urbanisation. On the rise, small villages are the turned into towns and cities; leading to an increase in human population and also the demand for land [6]. This scenario will lead to a *bigger reality* where habitat degradation not only affects native species and communities but human populations as well. Human's survival depends on healthy lands, because degraded lands are frequently lost to erosion, desertification, and nutrient depletion [10].

2.2.3 Habitat Fragmentation

Habitat fragmentation is often defined as a process during which a large expanse of habitat is transformed into a number of patches of a smaller total area, separated from each other and different from the original pattern.

Figure 3. Aerial view of sections of rainforest felled for small-scale oil palm in Sumatra, Indonesia. Source: Butler [14].

In simple term, forest fragmentation is the breaking of large, contiguous, forested areas into smaller pieces of forest; typically these pieces are separated by roads, agriculture, utility corridors, subdivisions, or other human development. It usually occurs incrementally, beginning with cleared patches scattered within the area. Over time, those non-forest patches tend to multiply and expand until eventually the forest is reduced to scattered, disconnected forest islands. Fragmentation is caused by both natural and anthropogenic processes in terrestrial and aquatic systems.

3. Causes of Deforestation and Habitat Loss

Multiple factors are responsible for deforestation and habitat loss, which could either be of human or natural origin. Natural causes of deforestation could be as a result of forest fires, droughts, exotic animals, floods, overpopulation of foreign animals and climate change. That notwithstanding, human activities are reported to be among the main causes of global deforestation with agricultural expansion, cattle breeding, timber extraction, mining, oil extraction, dam construction and infrastructure development reported as the primary causes[8]. The focus of this section shall be to identify the core human induced factors of deforestation; thus, agricultural activities and urbanization is drawn out as the main primary human causes.

3.1 Agricultural Activities

According FAO, nearly 80% of global deforestation are said to be caused by expansions in agriculture [28]. Forested lands of more than 50,000 acres are cleared by farmers and loggers everyday worldwide, and the equivalent of over 10,000 football fields are destroyed daily in the Amazon Basin alone [21]. The constant destruction of our forests threatens biodiversity, decreases carbon absorption, magnifies natural disaster damage, and disrupts water cycles.

Agricultural practices especially the type practised in the developing countries increases deforestation and habitat loss [10]. Bush burning is usually employed as a method of clearing natural forest in Nigeria for the purposes of agriculture [28]. Forests are set ablaze to clear space for agriculture, taking vegetation and wildlife with them. This process kills most of the nutrient available in the soil that makes it fertile. Subsequently, with the availability of the poor soil for agriculture, the level of yield depreciate also, leading to more quest to deforest more areas for agriculture to meet up to the needs of the growing population. The bad agricultural practice makes even the available lands barren, leading to reduction in food production and scarcity.

Figure 4. The aftermath of slash - and - burn farming in central Amazonia. Source: Laurence [20].

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Most of the deforested areas are in the rainforests, which are home to over 50 percent of plants and animals on the earth [28]. If humans were to continue to burn and destroy rainforest at the current space, thousands of species will be lost every year, and probably crops like wheat, chocolate, and coffee will disappear and the effects of climate change will likely double [10].

Animal agriculture is also a leading cause of deforestation in our forests today. On a daily basis, large portions of land are being cut or burned to make room for cattle grazing and feed crop production as a result of the global demand for meat. These animals require more space and nourishment, so millions of acres of untouched land are cleared every year to make room for feed crops and grazing pastures. As human population increases and more houses are being built, logging is becoming a top deforestation driver. The constant destruction of our forests threatens biodiversity, decreases carbon absorption, magnifies natural disaster damage, and disrupts water cycle.

3.2 Urbanisation

Usually in cities, people use more unprocessed or processed materials from the forest especially with the availability of more income for their expenditures [8]. Firewood, timbers, and herbs are highly needed in bakeries, construction and pharmaceutical industries. There are always greater demands for animal products and processed foods, which in turn drives the quest for more lands for livestock grazing and cultivation of crops. In most developing countries, the forested areas in the cities are being cleared to give way to developmental projects like the construction of markets, schools, parks, bridges, roads and industries. The governments of the developing countries focus more on developing and modernizing their environment than the preservation of the forest.

Figure 5. Deforestation of the tropical rainforests in Southeast Asia by this timber operation in Indonesian Borneo. Source: Laurance [10].

It is against this backdrop that some researchers have observed that urbanisation do not always lead to positive changes in the environment [6,7,8]. A typical example is the scenario of the city of Port Harcourt in Rivers State of Nigeria, which was popularly known and referred to as a Garden City in the 90s, because of the freshness and cleanliness of the total environment [6]. It was a city of few spaced structures with a lot of gardens, flowers and tall trees in every direction you turn. The then beautiful city was enclosed with beautiful forests in the neighbouring communities like Rumuigbo, Rumuokoro, Orazi and others, that is still evidenced by the single ancestral trees in some of the junctions of these communities today [6].

The once beautiful surrounding forests and vegetation of the city of Port Harcourt have disappeared into the "*so called development*" of the city [7,11,28]. Currently, airborne diseases and air pollution are normal occurrences as black soot has taken over the entire state [16,17,18]. In environmental sense, the city of Port Harcourt was truly developed in the 80s and 90s. However, in term of congestion, population and physical structures; it could be assumed by the citizens that Port Harcourt is now an ungraded city with many developmental structures. Speaking environmentally, urbanisation is one of the contributory factors to deforestation, thus, true development can only come through proper urban planning that encourages planting of trees and proper spacing between structures or buildings to avoid future congestion.

4. Consequences of Deforestation and Habitat Loss

4.1 Loss of Biodiversity

The most pronounced consequence of deforestation is the destruction of biodiversity. The forests house some of the most veritable hubs of biodiversity, covering mammals, birds, insects, amphibians or plants, the forest shelters many rare and fragile species. When humans engage in deforestation, they put the entire ecosystems in danger, creating natural imbalances, and putting their own lives at risk. The forest is a huge *support system* or a *web of connectivity*. For instance, the trees provide shade and colder temperatures for animals and smaller trees or vegetation which may not survive with the heat of direct sunlight. Besides, trees also feeding animals with their fruits while providing them with food and shelter they need to survive.

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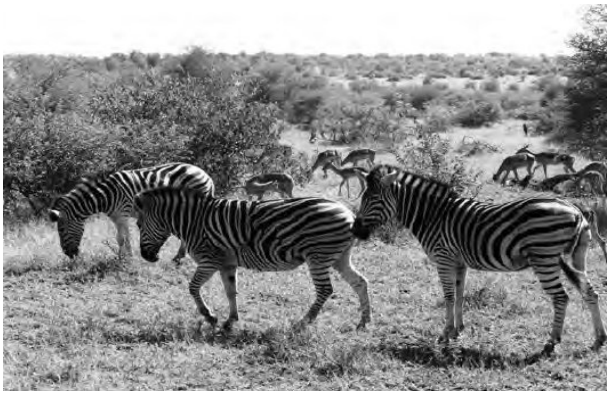

Figure 6. African savannas are threatened by livestock overgrazing and conversion to farmland. Source: Laurance [20].

The ecosystem is a web of dependence for survival. For instance, if a particular species of herbivores were to become extinct, it would affect populations of some carnivorous animals that depended on them for food. Each piece of an ecosystem relies upon other pieces; one species loss can have far-reaching consequences for other species. Deforestation is very disastrous for plants and animals, as many may not survive the effect. Deforestation that is accompanied by bush burning, can wipe out an entire species.

4.2 Soil Erosion

Deforestation usually reduces the quality of the soil. The soil in the forest is very rich in organic matter and also very resistant to erosion, bad weather, and extreme weather events. On the other hand, deforestation simply exposes the soil making it increasingly fragile, leaving it more vulnerable to natural disasters such as landslides and floods. Deforestation will also pose a serious erosion problem to the environment. These eroded soils can lead to disastrous mudslides. Large amounts of soil can wash into local streams and rivers, clogging waterways and causing damage to hydroelectric structures and irrigation infrastructure. In certain areas, soil erosion issues caused by deforestation lead to farming problems and loss of reliable electric power [15].

The truth is that, deforestation causes the soil erodes and washes away, causing farmers to keep moving to another land by deforesting more areas in quest of searching for a fertile land for agriculture. When a soil is eroded, it leaves the land barren and more susceptible to flooding, specifically in coastal regions.

4.3 Climate Change

Deforestation is a big contributor to climate change. Trees, on a daily basis specialises in trapping and absorbing excess carbon dioxide (CO_2) from the atmosphere which could have been harmful to man. The fact remains that when we cut down trees, we are releasing the already trapped CO_2 back into the atmosphere. Very unfortunately, these trees are cut down for the purposes of agriculture; as records show that *food and agriculture* account for 24% of greenhouse gas emissions, while deforestation is estimated to be responsible for 10-15% of all anthropogenic CO_2 emissions [15].

Global climate changes are as a result of greenhouse gases such as methane and carbon dioxide are gases that trap heat in Earth's atmosphere. Trees provide human with what they need most to survive which through the release of oxygen and water into the atmosphere, aside from eliminating the excess carbon dioxide through absorption. Global climate change can alter survival of wild animals, plants and humans through drastic weather changes and increased possibilities of natural disasters. Every year deforestation is contributing to the excess greenhouse gases in the atmosphere, leading to several habitat loss on earth because of the continuous cutting down of trees that acted as valuable carbon sinks [28].

4.4 Water Cycle Disruption

The trees also aid in the distribution of water on the earth. Water from Earth's oceans as well as from the surface of trees evaporates and condenses into clouds. Trees extract water from under the ground and release the same water into the atmosphere through a process called *photosynthesis*. Subsequently, this water in the atmosphere forms clouds that produce rain, which falls back on the earth forming run-offs on the surface, with some percolating downwards to produce groundwater and eventually ocean water again.

Deforestation simply implies that there will be no tree to extract, store and release into the atmosphere. This means that cleared forests, which once had moist, fertile soil and plenty of rain become barren and dry [15]. Unfortunately, when this natural sequence of water cycle is altered, it leads to what is desertification in the deforested area due to the change in climate. The trees help in controlling the level of water in the atmosphere through the regulation of the water cycle. When the natural forest is cleared, there is usually less water in the air to be returned to the soil. This causes the causes the soil to become dryer, reducing the ability of the crops to grow.

4.5 Environmental Refugees

The long term effects of deforestation are *environmen-*

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tal deterioration. People live around forested areas and depend on the forest resources for their survival. Deforestation of such forest can have adverse consequence on the people living around the forest. Most often people may be forced to migrate leaving them as "*environmental refugees*"—people who are forced to move away from their ancestral homes due to environmental degradation, which could be deforestation, sea-level rise, expanding deserts, and drastic changes in weather [3,7,12,14]. It has been reported that in recent time, people are more displaced by environmental disasters than by war [8].

4.6 Outbreak of New Diseases

The invasion of the forest by human for food or for games has led to the emergence of tropical diseases and outbreaks of new diseases, including deadly hemorrhagic fevers like ebola and lassa fever, which are consequences of deforestation [14,17]. These exploiters, who are pushing deeper into the thick forest, usually encounter dangerous microorganisms that they can transmit to those outside the forest on their return. Unfortunately, this bad practise of forest invasion and destruction could lead to a massive epidemic that could kill many innocents on our planet [14].

A scientific report reveals that land alterations especially the invasion of thick forests, brings humans in contact with pathogens (such as malaria and snailborne schistosomiasis). Most of these invasions are mainly for the purposes of development, leaving behind breeding grounds for mosquitoes because of the proliferation of artificial pools of water like dams, rice paddies, drainage ditches, irrigation canals, and puddles created by tractor treads [14, 17]. Malaria has become a common problem in deforested and degraded areas, and far less is experienced in the forested zones [14].

4.7 Destruction of Renewable Resources

Valuable renewable resources are destroyed yearly through deforestation leaving behind barren lands. The forests are the source of renewable resources that can significantly contribute to the economic growth of a country on a continuing basis.

When practised properly, logging can be a sustainable activity, generating huge source of revenue without diminishing the resource base. According to World Bank, an estimate of about US$5 billion in revenues is being lost annually as a result of illegal logging. Ecotourism of a nation also suffers from deforestation as no tourists, will want to travel in order to see polluted rivers, stumps of former forests, barren wasteland, animal carcasses, and abandoned settlement of former inhibiters [28].

4.8 Human-Wildlife Conflict

Most animals are forced out their natural habitat by hunters and other forest invaders. In the quest to escape from their hunters or in search for safer accommodation, some of these animals move into areas populated by humans which often resulted into fatal encounters with wild animals like tigers, lions and venomous snakes.

When the conflict between humans and forest animals is beyond bearable limits, many farmers simply kill the offending animals.

5. Environmental Education as the Solution to the Problem of Deforestation And Habitat Loss

Environmental Education is a process of learning that increases people's knowledge and awareness about their immediate environment and the challenges within. It helps in identifying environmental problems, developing the necessary skills and expertise. Environmental Education equip individuals with the ability to address their challenges, foster attitudes, build the necessary motivations, and commitment to make informed decisions and take responsible action that will benefit them and their future generation. The whole essence of environmental education is to bring the citizens to full knowledge of their environment, creating abilities that help them solve or mediate current environmental problems and avert new ones.

5.1 Basic of Goals of Environmental Education

Environmental Education enhances the acquisition of knowledge, skills, desirable attitude by an individual, towards a better interaction with the natural world (Igbinokpogie, 1990). According to Sola [24], the objectives listed in UNESCO-UNEP [26] for environmental education are as follows:

a. Awareness

In most situations, people lack knowledge of the happenings in their environment and the possible problems they might encounter in the process of interaction with their immediate surroundings. This is where environmental education comes in to sensitize the public by creating awareness about the total environment and its associated problems. Environmental education in this sense, help people have a clear understanding of the environmental problems being faced and possible alternatives to take.

b. Knowledge

Most times, awareness of the problem may not be enough in combating the possible consequences; having deep knowledge of the occurrence in the environment is the key to resolving any possible challenges. Knowledge

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of the environment and its associated problems can also come from cumulative one's experiences or through activism.

c. Attitude

Man's reaction to the environment reveals his understanding of the environment. Environmental education helps in the acquisition of social values, strong feeling of concern and the needed motivation that builds in us an attitude that encourages the protection and improvement.

d. Skills

Environmental education helps in the acquisition of the necessary skills needed in identifying and solving environmental problems and also help individual seek a balance between short and long range implications when taking environmental decisions.

e. Participation

When the aim of environmental education is achieved, participation of the citizens in identifying and solving their environmental challenges is usually expected. Environmental education uses participatory objective to ensure that everyone is carried along in the process of solving environmental problems.

Understanding our ecosystem and its beneficial function helps in the conservation and preservation of the environment. Most human influenced destruction of the environment is carried out in gross ignorance of the consequences of such actions [2,3]. A clear example is the people of the Niger Delta people in Nigeria who lived happily for several decades with the consequences of petroleum pollution until environmental activism and education exposes to them the dangers they are living in, and the calamities that awaits their future generation if they continue to stay in a polluted environment or permit petroleum pollution and gas flaring in their communities [2]. It was environmental education of the people of Ogoniland that lead to the stoppage of the operation of Shell Petroleum Development Company of Nigeria (SPDC) and the invitation of United Nations Environmental Programme (UNEP) to do the assessment of the environmental damage, and subsequently recommendation for a comprehensive cleanup of impacted areas in Ogoniland by the Nigerian government and SPDC [7,12].

Most unfortunately, petroleum pollution of the environment can be done deliberately because of the financial gains accruing to the state and the exploration companies [7,12,13]. This same practise is being carried out during deforestation where the governments of these defaulting countries who are the custodians of the laws of the environment, are the ones leading the mission of *eliminating the forests*. Environmental campaigns and activism on forestry protection and conservation in every country of the world will definitely go a long way to safeguarding the diminishing and already disappearing species in the forests, and also help to maintain balance in nature. Environmental education is therefore a useful tool in curbing human excesses in the environment through proper awareness and sensitization.

6. Conclusions

Deforestation and habitat loss is not about losing a few plants and animals, but also the survival of man hangs on it (Butler, 2019). Deforestation aids the mechanism of altering the already endangered planet earth; making it dangerous for plants and animals to survive it. The quest for more lands for agricultural activities and human expansions is further reducing the forested areas on the surface on the earth. Environmental education is the key to reversing continuous and deliberate human action through the protection of every natural forest and afforestation where necessary.

6.1 Research Prospects

Deforestation problem cannot be exhausted by a single article; thus every research in this area has prospected. For instance, deforestation and habitat loss in this study is viewed to be the consequences of negative human actions. Some other schools of thought have asserted that deforestation is actually a profitable activity, that is, socially, economically and even environmental wise. The questions that may need answers are:

1. Can human-induced deforestation be said to be beneficial in all sense?

2. Can the current rate of deforestation ever reduce or will it continue to increase with advancement of technology?

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