

Challenges of degradation in the Tropical Environment: Causes, Footprints and Remedies

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Abstract:

One of the challenges that pose threats to human survival in these contemporary times is environmental degradation. The over-exploitation of natural resources is currently at an alarming rate in developing nations with an unabated population increase like Nigeria and may continue to spell hardship and discomfort if efforts are not made by all stakeholders to checkmate the trend. The rate at which the human population is increasing also needs to be checked in order to ensure sustainable availability of environmental resources for both present and unborn generations. The control is necessitated to ensure that the natural resources such as soils, water, forest, mineral resources amongst others are sustainably utilized for human survival. This review therefore examines the subject matter of degradation in the tropical environment, its remote causes, consequences in order to proffer measures for checkmating the trend. The planet Earth remains the only one in the universe that accommodates life in abundance, and so, all stakeholders in environmental management and other related professions need to put in necessary efforts through which the degradation of the Earth resources may be curtailed.

Keywords: Degradation; Environment; Developing Nations; Natural Resources; Tropics

Introduction

Man's Perception of Environment: Ancient and Contemporary times

The term 'environment' first appeared in the early 17th century and was coined from a French word, "*environia*" meaning act or fact surroundings (Xu, 2017). Since then, the concept has passed through changes and usage, and is still changing since about 1910, but enormous shifts in the concept usage and definition were more prominent in the 1920s, 1970s and 2000s. Today, the term environment has become a household concept being used quite often to achieve human targets, especially in ensuring human survival and sustenance.

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In the light of this fact, Xu (2017) submitted that the concept of environment has not only become more and more abstract, but also abides in people's ideologies and serves as a tool in socio-political movements toward realizing a particular targets in human history.

In the 19th century the content of this term started changing. In the early 19th century, the term environment was extended from the surroundings to the more abstract and complex life circumstances through Carlyle's translation of Goethe's work, and it later was endowed with a new concept of organism-environment interaction through Spencer's Principles of psychology in the mid-nineteenth century and it got popularized since the late 19th century (Xu, 2017). The adjective term, "environmental", first appeared in literature in 1887 while in 1923, the term was coined to "emphasizing on environment in the development of an individual or group". By 1972, this subject matter was further developed and referred to as "the ecological sense of living things". It is referred to both abiotic and biotic environment.

From a historical perspective in the Nigerian context, forested areas within the country were seen as sacred environments or areas that man should not just tamper with or encroach into especially without conducting a form of appeasement to the local gods. Thus, these forests harboured the presence of several shrines for worshipping deities or gods which the local people believed to be the power residing in such forests (Babalola, 2011). Adesiji and Babalola (2012) reported that thickly forested zones were believed to be areas that should be preserved and or protected and safeguarded to the maximum for their sacredness. Thus, in most traditional settlements, many places covered with trees were regarded as no-go areas. Such places were given such names as *igbo aiwo* (which means forest no one should not dare to enter among the Yoruba tribe in the southwestern part of Nigeria. Apart from this, most forests found along rivers are places of worship of gods in some communities. For instance, *Osun* deity is worshipped in the forested zone along Osun River, *Igbo Oro* and *Odoje* worshippers stationed close to Oba River among the Yoruba people (Babalola, 2011;).

Some other ancient and ornamental items at times are being kept within the forested places in some areas. For instance, Oranmiyan Staff (*Opa Oranmiyan*) is kept within the tree covered areas in Ile-Ife, Nigeria. In addition, masquerade worshippers among the Yoruba tribe designated a forested area where *Oro* (another deity) and the bigger masquerades stay until the smaller ones come out to showcase their strength (Immigration and Refugee Board of Canada, 2000). With the growing trend of increased urbanization and population explosion, most of our natural forests and environment in totality are becoming swallowed up and so vanishing gradually in our traditional societies (Adesiji *et al.*, 2012).

The environment is where we live, it is an all-encompassing term comprising the totality of our physical, chemical, biological, social, economic, cultural components, with which man interacts and simultaneous to which he adapts and uses to satisfy his needs. Therefore Anjorin (2012), described the environment as consisting of water, land, air with their respective resources. The concept of environment has different definitions from different scholars' perspectives. For instance, The National Environmental Standards and Regulations Enforcement Agency (NESREA) defines it as comprising water, air, land, plant, animals and human beings living therein and the inter-relationships that exist among them (FGN, 2007). According to Sada (1998), environment is conceived as a system within which living organisms interact with the physical elements. Munasinghe (1991) defined environment as the natural and social conditions surrounding all human kind, and including future generations.

Okotoni (2004) corroborated the view of the World Bank report when he broadly considered environment as the totality of natural and human surrounding and activities including biophysical components and processes of the natural environment of land, water and air, including all layers of the atmosphere, all inorganic and organic matters, both living and non-living, socio-economic components and processes of the human environment including social, economic, technological, administrative, cultural, historical, archaeological, land and its associated resources. Though, several research have revealed that land degradation has its causes (for example, Maingwa et al., (2007), it has been equally discovered that the menace inflicts external or off-site costs which also impacts harder on the society. These impacts are, however difficult to evaluate because they are indirect, non-marketed and even difficult to trace (Barbier, 1998). In view of this, this investigation becomes imperative to examine the subject matter of degradation in the tropical environment, its causes, consequences in order to sensitize all stakeholders to the challenge and to proffer measures for checkmating the trend in order to ensure sustainable living on earth. The planet Earth remains the only one in the universe that accommodates life in abundance, and so needs to be protected by all.

Theoretical Background to explanation of Land Degradation

Three theories prominently used in environmental economics are often adopted to explain the concept of land resource degradation. These are social cost theory, collective good theory and the theory of property rights all of which are closely related to the concept of externality. The concept of externality refers to situations when the effect of production or consumption of goods and services imposes costs or benefits on others which are not reflected in the process charged for the goods and services being provided. Example of externalities include water pollution, deforestation, soil erosion, climate change among others (Centemeri ,2009; Spash, 2021). The concept of negative externality of which land degradation is one, according to neoclassical economists can only be resolved by creating markets for environmental goods to curtail further deterioration of the resource (Centemeri ,2009).

However, from the perspective of the theory of social cost according to Pigou (1920), it is argued that land degradation results from farmer's agricultural practices for which they do not bear the full costs, whether negative or positive externalities that cannot be transformed into income and force land users to adopt inappropriate production practices (Wachter, 1992).

The second theory, theory of collective goods shares some similarities with social cost since externs, according to Wachter, (1992) is part of collective goods. According to this theory, environmental problems such as land degradation emerge when users can exploit scarce environmental goods, such as crop farmland and grazing areas without contributing to their maintenance or conservation. Such users' unconcerned attitude towards conservation/maintenance are probably due to lack of motivation and that the benefits therein are dissipated among all users (Wachter, 1992).

The third one, property rights theory though with the other two theories the belief that land degradation emerged because of the externalities. However, this theory argued that the main problem is the absence of or poorly defined property rights to environmental goods (Wachter, 1992). It was stressed by the property theorists that if rights to land resource are unclear, unspecified, disputed (as in most developing countries like Nigeria) or nonexistent, then the land users are less likely to be interested in such resource conservation or in getting involved in any strategy that will ensure its long-term productivity. Thus, since the resource users have no

motivation to take required responsibility of the resource/s, they possess no moral justification to utilize the resource in a socially optimal way (Wachter, 1992; Hazell and Lutz, 1999).

Environmental Degradation and its Perceptions

Chopra (2016) defined environment as the physical surrounding of man/woman of which he/she is a part of and on which is dependent for his/her activities like physiological functioning, production and consumption. In addition, he defined environmental degradation as the disintegration of the earth or destruction of the environment through the consumption of assets like air, water and soil. Degradation means to bring down the grade of a resource (Lund, 2009). For instance, the stream water could be as of high quality as man wants it but with the introduction of particles of different kinds and qualities, the quality grade of the water changes to the extent that its direct consumption poses threat to human life. Similarly, soils in a natural environment will continue to maintain its quality as long as it remains undisturbed. Once any other externality is introduced into the location/environment, there is distortion in the status and the integrity of the resource, even when such externality seems to have a positive influence on the output of the resource the long run effect of the introduced material is degradation of the resource (Maurya *et al.*, 2020). For example, the use of chemical fertilizer may seem productive but it leads to the loss of the fertility status of the soil. In the long run, other features of environmental degradation include disfigurement of the land surface, aesthetic degradation like scenic degradation, disruption of biodiversity and deforestation with attendant ecological effects (Savei, 2012).

Ezeaku and Davidson (2008) defined land degradation (a variant of environmental degradation) as the loss of utility or potential utility through the reduction or damage to physical, social, cultural, or economic features and/or reduction of ecosystem diversity. It is also the temporary or permanent decline in the productivity of the land. What constitutes a degradation of the environment is a contemporary description of our natural environment. The first worldwide discussion on issues relating to the environment was held at United Nations Conference in Stockholm in 1972 with 114 nations in attendance. Babalola (2011) noted that the initial environmental value seems to be depreciating and, apart from the loss of value and benefits derivable from it, there are adverse effects of the loss of value.

The word ‘degradation’, means to ‘lose grade’ or ‘to fail to perform up to the initial level’. Thus, water becomes degraded if it could not be freely used for the same purpose it had served or could not serve the coverage it used to. Also, the air becomes degraded when the man feels that further efforts are required to put the air parcel into use as before. Thus in its actual sense, degradation of the environment implies that the environment has lost its status and could no longer be put into use as before (Figure 1) or its use could not conveniently and comfortably serve the geographical area it had earlier served. In other words, for a degraded environment to be put into use as before, it requires the effort of man to restore it back to its initial status.

The extent (coverage area) of environmental use by man and the level (numerical ladder) to which it can be put to use are two salient principles that must be considered when discussing environmental degradation.

a). The Extent (Coverage area): This principle is about to what extent a particular environment may be utilized. How much area can it cover without stress? How far can it reach, serving same purpose without any stress? An overstressed resource is bound to lose its integrity/quality and/or its sufficiency over the area being served initially if the situation is not halted. For instance, a

dammed surface water that is able to serve 250 km² at inception but over time could no longer serve the entire area again could be attributed to anthropogenic and natural effects which have led to the degradation of the dam environment. The causes of the degradation could be multifarious including increased sedimentation of the dam as a result of surface erosion (the event which may lead to reduced water volume of the reservoir); it could be as a result of the removal of vegetation in the vicinity of the dam environment, farming activities and aging trees could all contribute to the degraded value of the dam. A similar scenario is peculiar to soil resources.



Figure 1: Land badly degraded for human sustainability (*Source: Google image*)

A forested soil that formerly provides various forest resources for human use may become degraded as a result of deforestation, large scale agricultural practices (both crop production and animal grazing) to the extent that such resources could not meet up the demand and needs of that community. In which case, the community has to seek substandard alternatives. Thus, the replacement of hardwoods such as Iroko, Mahogany, Obeche, with fruit trees such as mango tree, kola nut tree or coconut tree is enormous and obvious signs of a degraded environment. Many other resources in the environment are all susceptible to degradation if not preserved and conserved sustainably.

b) Numerical Coverage: Environmental degradation could also be viewed in terms of the ability of the environment to serve the number which it served at inception or at the beginning (usually referred to as natural stage or undisturbed stage). Natural resource may be overstressed if it is used to serve more community than what it was designed for; thus becoming degraded because of its excessive use or overuse. By illustration, a dug-out well that serves a community at inception, if when degraded could not serve the community again as a result of distortion in the quality status of the resource. An environment becomes degraded when the land resources initially sufficiently used for agriculture without any crisis becomes a source of trouble for that community. Nigeria has been seriously facing the challenge of degradation in the past decades as farmers and herdsmen have been clashing over land resource. Herdsmen, in course of searching for pastures for their animals encroach into farms and consequently inflicting destruction on the crops. The much reported crises between farmers and herdsmen is a testimony of vast degradation of the Nigerian environment, most especially in the middle belt, south western and south eastern part regions of the country. Poor land use patterns have made land resources

become grossly insufficient to sustain for activities of both the farmers and the herdsmen, which leads to inevitable conflict.

Footprints of Environmental Degradation

Evidences of environmental degradation in the tropical environment abound and continues to multiply in these contemporary times. The reason for this may be attributed to the increasing struggles for the limited resources by human, which was initiated by the alarming increase in population and the implied urban expansion (Ray and Ray, 2011).

Poor agricultural yields: Environmental degradation has impacted on agricultural yields in diverse ways. Today, many agricultural lands have become degraded as a result of intensive and extensive water and wind erosion, application of chemical fertilizers, undue exposure of arable land, intensive animal grazing, removal of rich and fertile top soils in the process of construction and other engineering works. Nwokoro and Chima (2017) remarked that environmental degradation menace has aggravated the poor agricultural yields and poverty in the rural areas of Nigeria. The challenge has drastically reduced the per hectare yields in most rural areas of Nigeria. One of the challenges facing agricultural production in the eastern part of Nigeria is gully erosion. Ogundipe *et al.* (2020), using empirical evidence, discovered that there is inverse relationship between food security and environmental degradation, which implies that food security is being threatened with increasing degradation of the environment. In the same vein, Godson-ibeji and Chikaire (2016), and Azare *et al.* (2020) through a survey found that environmental pollution has impacted on agricultural yields as 82% of the respondents agreed that soil nutrients and fertility have been grossly affected by environmental pollution, while crop growth and crop yields have greatly been declining. Similarly, Table 1 shows available and quality of land resources suitable for crop production globally.

Fischer *et al.*, (2010) revealed that of about 13.3 billion ha of land available globally, only 4.4 billion ha are either prime or good land and so are agriculturally productive while about 7.8 billion ha are described as unsuitable for crop production and 1.1 billion ha are marginal lands. In view of these observations, suggestions were made for the appropriate stakeholders to arrest the state of continuous decline of the environment and its resource qualities for improved and rewarding agricultural production. Diao and Sarpong (2007), in the discussion paper number 00698 of International Food Policy Research Institute, examined the cost implication of agricultural land degradation in Ghana using multi-market model and found that as a result of land degradation, income from agriculture had fallen drastically by about US\$ 4.2 billion between 2006 and 2015. This is about 5% of total agricultural GDP within the ten years, thus suggesting Sustainable Land Management (SLM) as a remedy towards reversing the trend in agricultural soil loss.

Desert encroachment: There is still a debate on the relationship between desert encroachment or desertification and environmental degradation especially on which one results in the other. Suffice to say that desertification results in environmental degradation or otherwise? D'Odorico *et al.* (2013) reported that the term desertification was used to describe a poorly managed and low productive rangelands in Tunisia. Aubreville (1949) also reported that forest degradation in West Africa was a result of destructive land use and adverse management. He used the term desertification to describe desert-like conditions as a result of land degradation in the West African tropical forest belt.

Table 1: Global Availability and Quality of Land Resources Suitable for Agriculture

Land Quality	Cultivated Land (billion ha)	Grassland and Woodland ecosystems (billion ha)	Forest Land (billion ha)	Other Land (billion ha)	Total (billion ha)
Prime land	0.4	0.4	0.5	0.0	1.3
Good land	0.8	1.1	1.1	0.0	3.1
Marginal land	0.3	0.5	0.3	0.0	1.1
Not Suitable	0.0	2.6	1.8	3.4	7.8
Total	1.6	4.6	3.7	3.4	13.3

Source: culled from Fischer et al., (2010)

Increased siltation of streams and rivers, including other water bodies: Continuous exposure of land surface to the direct solar radiation and rainwater could aggravate environmental degradation, even though, such exposure is often necessitated by agricultural production, urbanization, and grazing of animals among other activities. An exposed surface is easily washed either by water or wind actions, thereby rendering the soil less productive except worked on. Such soils are easily washed downstream and materials are carried and deposited at the entry into a bigger stream (Issaka and Ashraf, 2017; Espa *et al.*, 2019). The persistent wash of such soil materials increases the siltation of the receiving stream. Though the deposited materials may be agriculturally beneficial downstream, the fact remains that the source region is already depleted and rendered degraded.

Soil compaction: Soil degradation results in soil compaction which may be detrimental to crop yield. According to McKenzie (2010) and Gregory *et al.*, (2015), soil compaction can be a serious form of soil degradation that can result in increased soil erosion and declined crop production potential. Other effects of soil compaction according to McKenzie (2010) include reduced soil pore spaces, decrease in the rate at which water reaches the soil root zone and soil, reduced water and air holding capacity, reduced soil organisms and also poor crop yield. It becomes extremely difficult to work on a compacted soil as a result of increased hardening brought about by misuse of environmental soil resources (Kusimi and Yiran, 2011).

Forested areas becoming grasslands Degradation is usually more feasible when a forested space becomes degraded which may be as a result of misuse and/or overexploitation of forest resources such as fuelwood, charcoal, manure and crop residues (Food and Agriculture Organization (FAO), 2007). Often a forested environment, if over-exploited may in the first instance become a shrub grassland mosaic which may eventually initiate desertification process if left unchecked over time (Figure 2). Degradation occurs in any forest systems when the production of an identified good or service is consistently below an expected value and is outside the range of variation that would be expected naturally (Keane *et al.*, 2009). Hermann *et al.*, (2016) reported that the Araucaria forest in Brazil has been reduced to a mere fraction of its original coverage as a result of excessive logging. Similar scenarios are experienced in most African nations like Nigeria where forest resources are depleted as a result of extensive harvest of the associated resources (Ogunwale, 2015; Ogundele and Oladipo, 2016). FAO (2001) reported that forest coverage in Nigeria has reduced drastically to year 2000 figure of 13.5 million hectares compare to the 1990 figure of 17.5 million hectares, indicating that about 2.6% of the coverage has been lost due to indiscriminate harvest of the resources in the forest.



Figure 2: Footprints of degradation resulting from deforestation (*Source: Google image*)

Soil Compaction in the Savanna belts: Similar to the experience in forested areas is also the scenario of what happens in a Savannah environment where effort is not made to checkmate over-utilization of savannah land resources. This region easily degenerates into desert as a result of scanty or lack of tree cover over time. There are reports to support the challenge of desert encroachment in the Sahel and Sudan savanna ecological zones in Nigeria (Macaulay, 2014; Olagunju, 2015; Saulawa *et al.*, 2018; Yahaya *et al.*, 2018). This experience is attributed to the continuous utilization, extensive and intensive use of the land resources in these zones. Desertification, otherwise described as land degradation becomes easily established as a result of the open land's treeless terrain. Several efforts are being made to convert such open lands into forest through tree planting programs to enhance and empower wind movement breaking. Also associated with overuse and exposure of savanna land is soil compaction. Development of hardpan can easily set in as a result of such exposure. At times the loose and/or granulated topsoils are removed either by wind or water erosion leaving the hard sub-soil which could be agriculturally unproductive, otherwise described as a degraded resource (Saulawa *et al.*, 2018).

Increased use of fertilizers: One of the reasons for the application of chemical fertilizers is to boost the fertility of the soil and/or to provide the soil with lost nutrients that occurred due to land overuse, soil erosion, overgrazing and loss of vegetation cover in order to boost crop yields. Thus the implication of the application of fertilizer is to regrade/upgrade the soil that is already degraded. Any new land that is under the natural cover will not demand the application of fertilizer since it has not been used or overused. However, continuous increased use of fertilizer due to continuous planting activity has the potential to cause loss of the quality of either on-site or off-site natural resources such as surface or underground water and soil. Cases of water quality loss as a result of continuous use of chemical fertilizer in Nigeria have also been reported (Obire *et al.*, 2008). In the same way, Hasnain *et al.*, (2020) reported the case of loss of soil quality as a result of the continuous use of fertilizer. Loss of aquatic life in the riverine area (Obire *et al.*, 2008) as a result of surface wash of chemical fertilizer has been reported equally. Several consequences of the continuous application of chemical fertilizer have given rise to the campaign against its use but replaced with the application of organic type.

Increased fire outbreaks or bush burning: The practice of burning is common among peasant farmers especially in the developing countries such as Nigeria, Ghana, Togo, Tanzania and other

African nations (Ref). The practice may be associated to the poverty level. This is because through the practice, farmland is cleared and get prepared for tillage or crop production. Also, the practice is viewed as a way of getting wild animals killed either for home consumption or for sale. Most farmers in the savannah belt of Nigeria are culpable to this practice. However, this practice is not without its grievous consequences like loss of biodiversity, subjection of soil to direct surface erosion and loss of micro-organisms amongst others. Kilahama (2011) had reported that bush burning and the incessant clearing of the soil has contributed to the degradation of soils in their study area. Degraded soils are usually characterized with hard soil (hardpan), scanty and usually tough trees, high content of clayey soils among others which are often initiated with persistent burning of bush (Neary *et al.*, 2008; Nyamadzawo *et al.*, 2013).

Pollution of the earth systems: Another sign of environmental degradation is pollution. Pollution rate is high in an environment that is already degraded. All environmental resources are liable to be contaminated as a result of degradation. Water, both surface and subsurface, soils, air have tendency to lose their natural quality status when the surroundings of their existence becomes degraded (Tappan *et al.*, 2004; Konstadakopulos, 2008; Vincke *et al.*, 2010). This is to show the significance of vegetal cover and its impact on the sustainability of the quality status of natural resources. Foliage protects natural resources from being exposed to direct surface erosion, sunlight rays and keeps the natural resources in its natural status over time. Thus, an environment that lost its foliage cover exposes its on-site natural endowments to other externalities which, and often may not be environmentally-friendly on the long run, especially, when the area forms the source region or prone to erosion, be it water or wind agents. However, the reverse is the case of the receiving region which often, is the downslope area. At the receiving region, the top and rich soil is deposited there which may be valuable to a potential user. Similar scenario is found in water resources which may be prone to contaminants of different kinds. Some dug-out wells have been abandoned or selective to users for a kind of use as a result of the distortion in the quality of the water. Thus, a particular well may be selected only for auto wash while some may have been selected for drinking or lawn watering. Ogunbode *et al.* (2017) discovered that pollution in their area of study was aggravated by the contamination of surface water to the extent that the inhabitants find it difficult to get water for their domestic use.

Harvest of premature trees as woods/planks: One of the human actions that have had grievous consequences and degrading effects on human natural environment is deforestation (Mba, 2018). Indiscriminate removal of trees from the forest without recourse to replacement (reforestation) has led to the loss of biodiversity and the exposure of natural resources to surface wash and intense sunlight. Giam (2017) in corroborating this assertion, attributed the increasingly bleak outlook of forest resources to the unabated deforestation and various modifications and alteration of forest resources borne out of various human activities.

Urban heat waves and development pollution: Another ravaging effect of environmental degradation is increasing urban heat waves and development pollution. Our urban centers today are becoming less attractive because of unbearable heat wave, rendering these areas unsuitable for human comfort. Urban centers can be said to be highly impacted by the vagaries of climate change. The impact of climate change is mostly felt in the urban centers located in many developing nations where environmental maintenance and care is not accorded high priority. Adeboyejo (2017), in corroborating this fact, opined that degradation of the physical environment is one of the implications of rapid urbanization in Nigeria. Most urban spaces are covered with concrete structures, urban trees are less encouraged except in few administrative capital cities.

The urban periphery has been left bare because of indiscriminate removal of vegetation (Ogunbode and Asifat, 2021). Apart from this, some urban centers do not have proper town planning blueprints, with little or no provision of spaces designated as lawns, green areas and nature parks. Such ill-planned environments have further aggravated urban discomfort associated with urban heat. Urban areas by their nature and composition are also highly predisposed to pollution via various sources. Atmospheric pollution arising from vehicular traffic and industrial emissions, fossil fuel combustion and power plants, (usually located within or at the precincts of the urban areas) and incineration of solid wastes often compromises affect air quality over many urban cities and the resultant negative atmospheric effects can be experienced over vast areas. Developed world countries like China experience very severe atmospheric pollution levels. Heavy metals, especially lead, have been implicated as a major source of soil contamination in urban areas arising from aerial emissions of vehicular traffic through the combustion of petrol containing tetraethyl lead, which are deposited, on roadside soils and vegetation (Jaradat and Momani, 1999; Olivares, 2003). Generally, the negative impact of human developmental activities in urban areas such as roads, bridges and housing constructions generally outweighs the positive benefits on the soil environment from an ecological stand point and thus takes its toll on soil health and productivity in such areas.

Human search for alternative sources of energy: The degradation of the human natural environment is not without its consequence on the availability of energy sources. One of the major causes of forest depletion in developing countries is the consistent use of forest resources as a source of fuelwood (Specht *et al.*, 2015; Saheen *et al.*, 2016; Asifat and Ogunbode, 2019). Man's search for firewood in forest regions in order to meet domestic energy needs culminates in, actions that poses threats to the continuous enrichment of forest resources. The implication of forest depletion is the development and use of Liquefied Natural Gas (LNG) as a source of energy. Though, the current practice of the use of LNG should have positive impact on the available forest resources by reducing dependence on natural resources, yet the local populace out of the level of poverty keeps depleting the natural forest both extensively and intensively with almost no effort for the replacement of the removed resources through reforestation (Asifat and Ogunbode, 2019).

Loss of biodiversity: An environment that is described as being degraded is an indication that that region has lost its flora and fauna components, otherwise called "biodiversity". Wild plants and animal resources are often domiciled in the forested area. While numerous plants thrive in this ecological zone, animals also take refuge in the tree community zone (Naeem *et al.*, 1997; Cardinale *et al.*, 2012; Ricketts *et al.*, 2016). However, extensive agriculture, lumbering, mining activities and uncontrolled animal grazing may all lead to degradation if cautions are not taken. Such anthropogenic activities will lead to removal of vegetal cover and eventual disappearance of wild animals and surface wash and loss of soil fertility- which culminated in the problem of a degraded environment (Figure 3). In furtherance, human efforts towards sustaining livelihood potentially undermine the capacity of ecosystems to sustain food production, climate regulation, cultural roles such as recreation and its supportive role as in nutrient cycling (Loreau *et al.*, 2001; Foley *et al.*, 2005; Harrison *et al.*, 2014; Eguiguven *et al.*, 2019).



Figure 3: Consistent soil tillage results in loss of biodiversity (*Source: Google image*)

Long distance eye-view in the formerly forested areas: Another clear footprint of a degraded environment is the ability and ease of sighting long distances in an environment that was formerly covered with trees/forest. When trees are removed without systematic replacement over time, it becomes possible to cover distances in human view because what was obstructing the view in the first instance such as trees, herbs and other plants have been removed. This is to say that environmental degradation makes it possible to view distances except otherwise hindered by rocky or rough terrain. Ibrahim et al (2018) had reported that despite the efforts to combat degradation of land along Nigeria-Niger border region, the treeless situation which gives room for the ability to view distances. Thus, suggesting that forest conservation should be allowed to thrive in the region.

Herdsmen/Farmers conflict: A peculiar sign of environmental degradation in Nigeria and in some other African nations is various clashes that have been ensuing between farmers and herdsmen (Macaulay, 2014; Adeoye, 2017; Saulawa *et al.*, 2018; Yahaya *et al.*, 2018). Several cases of killing, maiming, animal rustling, crop farm destruction by herders' animals among other have been reported as a result of such clashes. Though, climate change scenario has its own stake in the causes of inadequate fodder for animals, the technological development and medical research which brought about the various development of veterinary drugs and vaccines to cure sleeping sickness in cattle contributes to the continuous depletion of forest resources in feeding animals (Zoomers and Noorloos, 2013; Oghuvbu and Oghuvbu, 2020; Lezuya, 2021). This development has enhanced the sustaining domestication of the cattle in the southern parts of Nigeria which was formerly uncondusive for the animals due to the presence of tsetse flies that inflict sleeping sickness on the cattle.

Causes of Environmental Degradation

Land degradation is more pronounced and evident where conditions of environmental vulnerability already exist because of arid climate and unsustainable forms of land exploitation (Gwangndi *et al.*, 2016; Halbac-Cotoara-Zamfir, *et al.*, 2020). Figure 4 shows the proportion of each phenomenon that contributes to land degradation globally. The highest contributor to the global land degradation is due to overgrazing contributing 35% while deforestation is next with 30% and overcultivation contributing 28% to the degradation of land. Moreover, the causes of degradation in human-environment according to Ezeaku and Davidson (2008) could be attributed to a single or complex mix of causes. While there are nature-induced factors, there are also human-induced factors that contribute to environmental resources degradation. According to the duo, the causes include biogeophysical (natural) such as climate vagaries of water and wind erosion; poor land use, inadequate land and water management policies, deforestation/over-exploitation of forest ecosystem services; socio-economic factors as it relates to burgeoning human population in our contemporary times (Ray and Ray, 2011) and also pollution/contamination of land resources and institutional factors in the areas of deficiency and/or inadequate land policies. Generally, the anthropogenic causes of environmental degradation according to Adejumbi (2017) are increased urbanization and population explosion, inadequate environmental education, poverty and industrialization Other causes include extensive and intensive mechanized and commercial farming and salinization of agricultural land, indiscriminate harvest of forest resources, excessive uses of natural resources, poor urban planning, uncared attitude towards the environment and its resources, incessant bush burning and so on (Jiboye and Ogunshakin, 2011; Adeboyejo, 2017)

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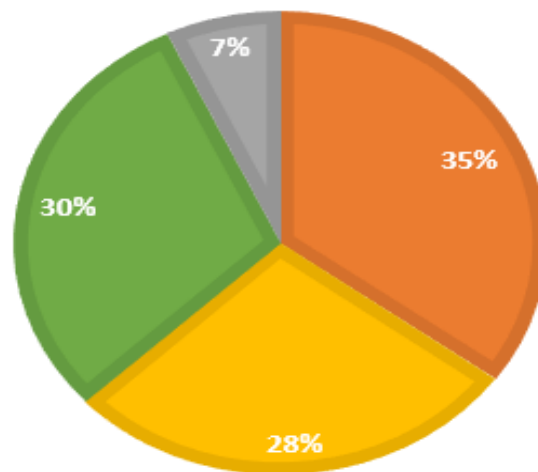


Figure 4: Causes of land degradation globally. (Source: Google image)

Natural causes of environmental degradation

Natural causes include those factors relating to climate change vagaries and surface erosion. According to Issaka and Ashraf (2017), having established that there is a relationship impact of soil erosion and degradation on water quality indicating the source of pollutants as anthropogenic and industrial activities has concluded that erosion causes both on-site and off-site effects on land and water bodies thereby affecting its quality.

Remediating Environmental Degradation

Continuous degrading in human environment will pose a great threat on the survival of man on the surface of the earth. Gwangndi *et al.*, (2016) from legal point of view lamented that environmental degradation, if not curtailed, will affect human health and also jeopardize the right of people to health. Man depends on various natural resources endowed, thus any uncontrolled degradation implies that the resources that enhance human livelihood will not be rightly and sufficiently be available again at the right quality, resources that cannot be substituted. Man can easily obtain alternatives for some resources while some do not have immediate substitute. This implies that the resources whose supplies cannot be replaced with any other are likely to pose serious danger to the existence of man if not remediated, if their respective degradation level cannot be reverted. Good examples are water and air especially. These two resources should be in the right quality and must be available in the required quantities to support human survival on this planet. However, though there are some resources that are finite while some are infinite, some are exhaustive while some are not, some are recyclable while some are not, biotic and abiotic, sustainable management of these varying resources are significant for man's comfort and livelihood. Therefore, it becomes a serious challenge to stakeholders at different levels, local, national and international, to ensure that in-depth studies and research are put in place to maintain the continuous availability of the resources both now and future use Akbulut (2014). It needs to be reiterated here that all hands need to be on deck to achieve sustainable remediation to the challenge of degradation in the environment. Some of the ways of reversing degradation of human environment are highlighted as follows:

a. **Instituting appropriate and executable legal instruments:** Instituting relevant legal instruments which will be implemented by the appropriate body charge with such responsibilities will aid compliance to the rules and regulations to guide the management of environmental resources (Al-Amin, 2013). Illegal actions such as poaching, felling of woods and illegal clearing of environmental resources such as forest and grasslands for purposes not backed by law can be checkmated promptly. Gwangndi *et al.* (2016) had suggested that there is need for the enactment of enforceable laws at both international and national levels for the protection of environment so as to enhance respect and commitment to a clean environment, which will invariably contribute to human health.

b. **Appropriate enlightenment and education at different levels:** Enlightenment and education of people especially at local level are required on the importance of environmental protection, preservation and conservation (Akbulut, 2014). This will be very appropriate in most developing nations where resources in the environment are exploited without recourse to the future generations' needs of these resources. Resources are exploited in these agrarian based economies as if it is infinite. It is expected that communication by means of placing radio jingles, musicals, flyers, organized lectures and talks among others will go a long way to broaden the understanding of people on the issues relating to environmental resources protection. van Crowder *et al.* (1998) and Akbulut (2014) also emphasized that increasing rate of awareness and understanding of the environment through proper education and enlightenment of the people especially at local level would be a remedy and a possible cure for environmental degradation in developing countries.

c. **International aids to the less privileged countries to combat the menace:** One of the most important causes of overutilization of environmental resources is poverty, especially among the developing nations. Most of the categories are confronted with myriads of socio-economic

challenges to be saddled with meaningful contribution to mitigating environmental degradation (Amaechi, 2009). Thus, it is very crucial that the well-to-do nations of the world rise to offering aids and grants to these developing countries (Opřsal and Harmáček, 2019). Direct involvement in such projects such as combating erosion, tree planting, combating desertification encroachment, among others will assist in checkmating the problem of degradation. It is important to acknowledge that solving individual challenges across all the nations of the world is solving global challenges.

d. Political will of the ruling class to subdue the challenge of environmental degradation: It is imperative that the political class of the world should develop a willingness attitude towards solving the challenge of environmental degradation. When there is political willingness at local, national and international levels, the challenge can be mitigated to a large extent (Amaechi, 2009). Sound collaboration among all stakeholders including the non-governmental agencies, philanthropists, associations and individual groups will engender various conferences, lectures, talk or workshops which will assist in revealing causes and implications of degradation in human environment, the activities can all lead to finding solutions which are sustainable globally, afterall, the only planet that accommodates life and in abundance is the earth. So its collaborative maintenance by all brings about human comfort and sustenance (Howes *et al.*, 2016).

e. Urban and Regional Planning: Poor urban planning contributes to urban degradation. It is noteworthy that proper planning enhances appropriation of different land parcels for the right use or uses (Kustysheva, 2017). Cases of land misuse are particularly rampant in most developing countries often influenced by the political class. Thus, most lands designated and marked as government reservation areas, recreation centers, parks and gardens, botanical and zoological gardens among others have been misappropriated and misused by power be for their selfish ends. Apart from this, most lands that have been marked as roads, markets, squares/rectangles among others are often illegally used up by many other individuals without any consequence, often as a result of overwhelming corruption in the governance (Daramola and Ibem, 2010). One of the remedies to environmental/urban degradation is the ability to enforce the city/town master plan which had been painstakingly and technically drawn to meet the needs of the society both now and the future. Proper planning will also engender the conservation and preservation of environmental resources to safeguard the depletion and total extinction of biodiversity from the environment (See also, Munasinghe, 1991; Freire, 2006; Pavitasari, 2015; Kustsheva, 2017). Cases of depletion/degradation of various environmental resources such as wildlife, plant species among others have been reported (Ref). Appropriate policies should be put in place to checkmate the release of industrial effluents and other emissions (Panagopoulos *et al.*, 2015; Kuddus *et al.*, 2020).

Availability and accessibility of research funds on the related fields: Availability of fund for in-depth research into various environment-related issues also will go a long way at enhancing various issues about the state of human environment and the possible state in the future and also proffer remedies for the revealed anomalies and possible continuous enhancement of the positive trends discovered (Duru, 2004; Danjuma *et al.*, 2014). Award of grants and other incentives to researchers or their respective institutions will help to pursue such related investigations so that the details of the environment, its status, utilization, and challenges among other areas can be identified and remedies can be recommended for appropriate implementation (Guo *et al.*, 2018). International collaboration in this area will encourage this factor.

Exploitation of the naturally degraded regions of the world: Arid and semi-arid areas are often regarded as naturally degraded areas in the world. Global trends have however shown that these lands can still be put into productive ends.. Libya and Israel converted the part of the deserts in their respective country into agriculturally productive lands (Ahmed, 2015). Malagnoux (2007) had also reported that embarking on massive tree planting and greening exercises will help in creating a sustainable environment that enhances human comfort and survival. Many of such barren land in the Sahel savanna in the extreme northern fringes of Nigeria have been converted into arable land through tree planting exercise to mitigate desert encroachment (Macaulay, 2014).

g. Population control especially in the underdeveloped nations: Rapid population plays a very significant role in the declining forest, soil and water resources (Ray and Ray, 2011; Zaman *et al.*, 2011) It is imperative that the continuous and alarming increase in the human population will make an impact on the utilization of natural resources which is finite in supply. Thus it is required that the increase in population is checkmated through different and available methods. This observation is more peculiar to developing nations especially in African and Asian countries. The increase in the global population has enormous impact direct correlation on the environment in terms of furniture and housing needs, household needs, energy needs, water needs for agriculture, domestic and industrial uses and so on (Sherbini *et al.*, 2007). It is required of underdeveloped nations to intensify effort to curtail alarming population increase in their respective countries.

h. Adopting modern agricultural technology: One of the activities of man that has impacted on environmental resources is agricultural practices (Rehman *et al.*, 2016; Santiteerakul *et al.*, 2020). Expanse of lands is required for both crop production and animal husbandry. This makes encroachment into the land resource significant especially in the developing countries. However, the trend of agricultural practice in contemporary times has made it technologically- driven. This implies that with technology, yields on a hectare of land can be boosted than ever. Efforts are required to minimize the utilization of natural resources for the sake of conservation of such resources for the born and the yet unborn generations. Also associated with this is the adoption of reuse and recycling of resources so as to sustain the existing resources (Luo *et al.* 2016). Much dependence should be on renewable and environment-friendly energy sources

Conclusion

There is no other planet that accommodates life and in abundance as the earth. The earth supplies various resources which enhance human living comfort and sustenance. This review examined the impact of human utilization of environmental resources and also suggested measures to take to curtail the continuous degradation of the environment. The trend at which human population is increasing without recourse to the finite resources in the environment needs to be checkmated, otherwise the man's survival may be under jeopardy. All hands must be on deck to control depleting forest and water resources, wildlife, mineral resources, land resources and so on. The collective efforts at local, national and international levels, rulers and the ruled, male and female, young and old, are demanded for the control of the continuous loss of human environmental integrity so as to sustain human life on the earth.

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