HUMAN IMPACT ON THE EARTH'S SURFACE AS A CHALLENGE TO SUSTAINABLE ENVIRONMENTAL DEVELOPMENT IN NIGERIA – A REVIEW

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ABSTRACT
This review ex-rays some human activities and their consequences on the earth's surface; human impact on vegetation, soil, oceans and seas, landscape and the process of urbanization were extensively dealt with. The article pointed out the adverse effects of man's activities on the land which result into soil erosion, soil compaction, and increased evaporation, among others. Persistent cutting down of trees has caused droughts and gradual shift in the Inter Tropical Convergence Zone (ITCZ), thus resulting into climate change globally. The work also pointed out some of the consequences of the misuse of oceans and seas such as dumping of toxic waste, industrial waste and oil spillage, which has adverse effect on aquatic life. The process of urbanization was also considered with the phenomenon giving examples of some cities in Nigeria. Finally, the work suggested careful interference with natural resources, to avoid over usages as well as emphasizing best ways of environmental protection.

Keywords: Human Activities, Environmental Sustainability and Development.

Introduction

With the rapid growth of the world's population, many societies have been demanding more from the earth's resources and affecting its land surface, at ever increasing rates. Prehistoric evidence shows that in Paleolithic times, the early hunter-gatherer used fire, and accidentally or intentionally, burnt large areas of land, to create farmland or pasture, modified the soil by ploughing, changed the drainage by irrigation, introduced or bred new animals and crops, and altered the natural vegetation structure of many regions (Pickering and Owen, 1995). In more recent times, humans have destroyed enormous track of natural vegetation, excavated large areas of land, greatly modified the landscape, and even created new land.

Unfortunately, some renewable resources are being used at rates that exceed the speed at which they can be generated. Nowhere is this more apparent than in the destruction and deforestation of the rainforests. A hectare of forest can be destroyed within an hour, but it may take several decades for the forest to regenerate itself. The United Nations Food and Agricultural Organization (FAO, 2019) reported that destruction of the tropical rainforest is estimated to be occurring at the rate of 80 million acres per year, mainly as a result of human activities. These effects complicate the problem, for example, rapid degradation of the forest soil accompanies deforestation, the nutrients being washed out by rain. In addition, the organic compounds are no longer replaced in the soil. It may take decades of slow regeneration before the soil can support a forest again. Other effects may lead to change in slope stability, the amount of soil erosion, increased washing of sediments into rivers, changes of climate within a small region, and the increased occurrence of floods (Burman, 1991).

There are many examples of how uncontrolled or excessive exploitation of the land's natural resources (including vegetation, fossil fuel, minerals, water and land) can have a

profound effect on the natural environment, both in terms of ecosystems and the aesthetic beauty of landscapes. This article has considered the main effects caused by the exploitation of resources on vegetation, soils, ocean, and the landscape.

Human Impact on Vegetation

Vegetation is important to humans as a primary source of food, as building material, in manufacturing industries, as fuel and as medicine (Adeleke and Leong, 2004). Early in human history, people gathered plants and began to cultivate selective types of crops. With agricultural activities, came the associated changes in the shape of the landscape.

The first human impact on vegetation which is still prevalent, is the use and misuse of fire. Even though over half of the fires that occur are natural, resulting from lightning strikes or spontaneous combustion of decaying organic material, the rest can be attributed to accidental or deliberate burning by humans (Tartenger, 2017). Accidental fires may result from agricultural uses, dropped cigarette stubs, rubbish heaps, children playing with fires, camp fires, train, motor vehicles, and so on. Deliberate burning is used to clear land, though it can be used to help improve the quality of the soil, and in and some regions, through adding fresh organic material, or as an aid to reduce widespread fires (Otitoju, Yakubu, Otitoju and Uka; 2019). Fires cause a reduction in the vegetation, threaten wildlife, humans, and property. Fire produces secondary problems associated with the clearance of vegetation, such as erosion, flooding and wind erosion.

Nebel and Wright (2009) added that apart from fire, the domestication of animals also has a major impact on the earth's surface. Heavy grazing of cattle leads to trampling and compaction of the soil, reducing its capacity to hold water, and altering its structure. Ultimately this leads to soil erosion, both by wind and water. Selective grazing or particular plants may lead to changes in the nature of the vegetation cover leading to deforestation.

Deforestation involves the deliberate removal of forest to create new agricultural or urban land to provide wood for building and manufacturing industries (Snynman, 2003). This exploitation of minerals and fossil fuels is meant to create reservoirs for water supplies and hydroelectric energy, to build highways, for fuel, or as a result of defoliants used to help locate enemies during wars. Nilson and Pitt (2010) buttressed this point that the tropical and equatorial rainforests are shrinking at alarming rates because of deforestation, and there is little sign of a real slow down in this destruction. According to United Nations Food and Agricultural Organization (FAO, 1992), the information obtained from satellite and aerial photograph reconnaissance in 88 countries showed that rainforest is disappearing at the rate of one acre per second, equivalent to the combined size of West and Central Africa annually.

Burman (1991) has pointed out that desertification also has a great effect on the vegetation cover. Deforestation and degradation of other vegetation, particularly near the margins of deserts, have caused once fertile/vegetated land to become barren in a process called "desertification". Factors that contribute to the expansion of desert regions also include bad land management and poor farming techniques. Desertification and its associated problems are devastating in many parts of the world, especially developing countries. These include the desert margins of the Sudan, the Sahel Region of the Southern Sahara Desert, the Gobi Desert in China, and the Kalahari Desert in South Africa. The margins of these deserts have advanced as much as 100 km, in the last couple of decades. The United Nations Environmental Programme (UNEP, 2003) has calculated that about 60 percent of the 3.3 billion hectares of agricultural land outside humid areas are affected, to some degree, by desertification.

Although the United Nations claims that desertification, caused by human activities, is continuing to intensify, many argue that this may not be true (Peace, 2012). Many scientists also argue that desertification has not occurred as a result of human activities (Hulme, 1989), and that land degradation attributed to cattle herding and overgrazing, particularly around

watering holes, does not lead to desertification in the Sahel region (Peace, 2012). It is believed that cattle herders possess an innate knowledge and sensitivity towards the land, and therefore contribute little to its degradation. Instead, it was argued that the apparent effect of desertification may be the result of natural fluctuations in global and regional climate, such as drought which is inherent in dry lands.

Additionally, it is well known that desert margins oscillate by tens of kilometers on a scale of years, depending on variations in rainfall (Hulme, 1989). Drought, however, may be the result of human-induced global warming, but this assertion remains unproven. Street-Perrott and Perrott (2009) argued that fluctuations in aridity are due, at least in part, to the development of the North Atlantic Deep Water.

There is much debate as to whether desertification is reversible. Though many attempts have been made, such as irrigation and revegetating desert margins, and many have proven successful, it is not known how long an area can sustain itself when maintenance is discontinued.

Human Impact on Soil

Soil is another great resource. It is a combination of mineral and organic matters, structurally arranged in layers, and capable of supporting plant and animal life. Soil cannot exist without plants, and plants are dependent on soils for support, air, water and nutrient. Soils are highly variable in nature. This variation includes their structure, layering, colour, range of particle sizes, chemistry, physics, nutrients, acidity, temperature, water content, thickness, organic content, and its associated biota. These properties vary because of differences in the parent material, climate, topography, organic content, and the amount of time it has taken to develop. Changes in one or more of these factors may drastically alter the soil properties, changing its nature and ability to support particular plant species. These changes can happen very easily, having profound effects on the soil and the landscape, such as vegetation reduction, soil erosion, slope instability, increased flooding, and more sediments in rivers. The major changes include: chemical changes, structural changes, hydrological changes and soil erosion.

There are many chemical, changes within a soil which can be initiated by humans. The most widely spread and problematic are salinization and laterization (Gbulam and Nyberg, 2020). Salinization involves the accumulation of salts such as sodium chloride, potassium chloride, calcium sulphate, and sodium carbonate within a soil. This makes the soil alkaline, caustic, and generally restricts or inhibits plant growth. Salinization may also lead to secondary problems such as soil erosion, resulting from poor plant growth. Salinization may occur naturally in semi-arid and arid areas, where evapotranspiration or direct evaporation from the soil exceeds precipitation. It may also occur in coastal regions, which have saline groundwater. In areas where the evaporation of water from the soil is high, water is drawn upwards and evaporated from the soil surface. Hence salts are left behind and are concentrated near the surface of the soil.

Laterization of the soil is a major problem in the tropics, where soils are enriched in aluminum and iron oxides. These metal oxides accumulate due to a strong weathering. Minerals in rocks are decomposed releasing metal ions into the soil water. These are transported, precipitated, and concentrated by seasonal wetting and drying of the soil as layers of metal oxides. Problems that occur when these lateritic layers become exposed to air are: They become hard and inhibit plant growth leading to soil erosion and its associated problems. Exposure of these layers may also be due to soil erosion, often as a result of deforestation. In addition, deforestation may lead to increased evaporation of water from the soil, enhancing the process of laterization. The extent to which laterization is a problem has not been fully assessed, but particular problem areas include Northern India, the Cameroons, and Central Africa (Kelvin and Levis, 1994). Unfortunately, populations in these countries are

heavily dependent on soil, for substance agriculture and degradation is often difficult to reduce due to increasing pressures of population growth on those lands.

Human Impact on Oceans and Seas

The oceans and seas cover more than two-thirds of the earth's surface (Muniz, 2014). They contain sub-marine trenches that are deeper than the highest mountains. Life almost certainly evolved from the sea, and there is still more species diversity in the sea than anywhere else on earth. Many of the food chains or food webs start with organisms inhabiting the seas and oceans. The ocean-atmosphere system regulates global climate. It is a sensitive thermostat. The seas and oceans are rich food resources (fish). Humans still tend to feel that the vastness of the sea makes it an ideal dumping ground for virtually every type of waste, including toxic chemicals and nuclear waste. These activities tend to affect the oceans and seas.

According to Kelvin and Levis (1999),the United Nations Convention on the Law of the Sea (UNCLOS) states that oceans and seas are a "common heritage of humankind" which cannot be appropriated by any individual, institution, or country and must be managed for the benefit of human kind as a whole, therefore must be conserved exclusively for peaceful purposes. This law, which has not been observed anywhere in the world, has great consequence on the ocean and sea waters.

Human Impact on the Landscape

The land's surface is an important resource, allowing us to build settlement, produce communication links, and have farmland and recreational areas. It is also beneath this land that mineral resources and fossil fuels are to be found (Ode, 2016). But in order to access these resources, we have to excavate the land surface and dump the rock waste, which in turn creates new land forms.

Human activities are continually modifying the landscape, creating pits, ponds, spoil heaps, terraces, cuttings, embankments, dykes, canals, reservoirs, and areas of residence. Geomorphologists consider humans as important land-forming agents and refer to us as geomorphological anthropogenic agents. Many consider that for large regions of the world, humans are an important factor in contributing to the landscape we see today (Adeleke and Leong, 2011).

The rapid increase in population has placed great demand on the available living space. The trend towards urbanization has led to an increase in the size of settlements at an incredible rate, and the exploitation of marginal lands. In the latter, natural processes constitute a hazard to people settling in those regions. Advances into these areas are often accompanied by rapid deforestation and de-vegetation, resulting in soil erosion, flooding and other associated problems. Other activities that can affect the land surface include: mineral extraction, dumping of hazardous/toxic substances and waste among others.

Urbanization

Since ancient times, cities have played a central part in the economic, political and cultural development of societies. Cities serve as the commercial and administrative focus for nations, and generally provide the main places for both the production and consumption of goods and services. According to United Nations (UN, 2004), the world urban population reached 2.9 billion in 2000, corresponding to 48 percent of the total world population. Much of the population growth that occurred in the past 50 years, and most of what will occur in the next 30 years, concentrated in the urban areas. The majority of the urban population growth is expected to occur in developing countries, where it is projected to increase by 2.3 percent per year between 2000 and 2030 as opposed to an increase of only 0.5 percent in developed countries.

The United Nations Report highlights the differences in urbanization rates and number of urban dwellers, by region as well as size of cities, expected to absorb most of the population growth in the next 15 – 30 years. For example, the proportion of people living in mega cities (with population greater than 10 million) across the world is still fairly small, amounting to 4.1 percent. In 2000, this figure was expected to rise to 5 percent by 2015. Overall, by 2015 it was expected that only 8.7 percent of the world population will live in mega cities, in the developed countries, as opposed to the 27.2 percent expected to be living in urban settlements with fewer than 500,000 inhabitants in developing countries. In Nigeria, urban centres are arising at an alarming rate due to rural-urban migration. Examples of these cities include Lagos, Ibadan, Kano Port Harcourt, Calabar, Abuja, Kaduna, Jos, Makurdi, etc. Urbanization can cause many problems such as changes in the hydrology of an area. New canals may have to be constructed and rivers canalized in areas where water ways are blocked due to urbanization process.

Suggestions

Since rapid population growth has resulted to increased demands upon the earth's resources, which has led to accelerated environmental degradation, people should be encouraged to make use of the new wave of technological development, as a way to enhance environmental quality, through the use of technologies that are eco-friendly such as waste management, waste to energy power plants and pollutants – reducing modes of transportation.

Human impact on land being enormous, land use has changed, natural vegetation is cleared for agricultural use, settlement and urbanization increase, reservoirs are created, minerals are extracted, and more land is developed for recreation purposes. Deforestation should be controlled through government regulations banning cutting of trees, reforestation and afforestation, etc.

All stakeholders of mining in consultation with government and the chambers of mines should support initiatives that reduce health hazards and environmental degradation. Acute concern is now widely expressed over the deforestation of boreal and tropical forests, the degradation of grasslands and wetlands, and deforestation. Such destruction of natural ecosystem has led to a reduction in biodiversity, and impoverishment of soils.

Government should make laws to regulate the use of forest communities in a way that ensures the protection of nature and respects human rights. False solutions like biofuels, biomass or carbon offset that release more greenhouse gas emission should be avoided.

Human impact on soils has also caused considerable damage, commonly because of poor agricultural practices, excessive water extraction, poor irrigation methods, defoliation and compaction by heavy vehicles and animals. The cumulative effects of these can be disastrous to countries, whose economies are heavily dependent on agriculture.

Basic education should be given to farmers on advanced farming practices that improve efficiency in farming. Agricultural extension services through online classes and training seminars should be made available for players in the agricultural sector, to ensure that they are currently deploying the best practices on their farms.

The impact of humans on the oceans and seas, resulting in pollution by dumping waste products, over fishing, mineral extraction and removal of rare and important marine life such as corals. Regulatory instruments should be made to prohibit direct discharge of pollutants, limit the marketing and sale of dangerous products. Restrictions should be imposed on harmful agricultural practices and farm regulatory approaches should be adopted which require inspection or self-reporting to ensure compliance, with violations subject to penalties such as fines and compensation payments.

Conclusion

Clearly, humankind has radically altered the earth's surface, with accelerated impact in recent times. There is a need to understand the natural systems and the interaction between various earth-surface processes and the impact of human activities, in order to be able to predict the consequences of human actions, and to manage resources in sympathy with the natural environments. In doing so, people should take cognizance of the analysis made in this work.

Finally, the exploitation of the earth's resources inevitably produces waste, some of which may be hazardous/toxic. Until the past few decades, much of this waste has been disposed of without any concern for the damage to ecosystem, and frequently under the auspices of "not in my back yard". Today as environmental issues are becoming more focused, there is much greater awareness of containments to reduce the contamination of water bodies, preservation of land and vegetation in general.

REFERENCES

Adeleke, A. and Leong, G. (2004). *Human and Physical Geography.* Ibadan, University Press. Pp: 62-71.

Adeleke, A. and Leong, G. (2011). *Human Impact on the Earth Surface*. Ibadan, University Press.

Agotti, T. (2013). *Metropolis in 2020s: Planning Poverty and Politics.* London: Routledge

Burman, A. (1991). Saving the World's Savannas. *Journal of New Scientist,* 2 (2) Pp 30-34.

FAO (1992). The State of Food and Agriculture. Rome.

Gbulam, S. P. and Nyberg, N. (2020). Chemical and Physically Changes and their effect on our environment chemistry Teacher Education Unit, University of Helsinki.

Hulme, C. (1989). *Some Lessons of the Debt Crisis*. Oxford: Oxford University Press.

Kelvin, T. P. and Levis, A. O. (1994). *An Introduction to Global Environmental Issues.* London. Routledge.

Kelvin, T. P. and Levis, A. O. (1999), (2nd Ed.). *An Introduction to Global Environmental Issues.* London: Routledge.

Muniz, I.P. (2014). *Freshwater Acidification: its Effects on Species and Communities of Freshwater.* Edinburg Royal Society Publications on National Environmental Programme

Nebel, B. J. and Wright, R. T. (2009). *Environmental Science. The Way the World Works.* 4thedn. Englewood Cliffs: Prentice-Hall

Nilson, S. and Pitt, D. (2010). *Mountain world in Danger: Climate Change in the Forests and Mountains of Europe.* London, Earthscan Publications

Ode, A. (2016). *Human Activities and Climate Change.* Ibadan. University Press.

Otitoju, O., Yakubu O. E. Otitoju G. T. O., and Uka, D. (2019). A review of impact of recurrent bush burning on climate change paradigm: The Nigerian Experience, *International Journal of Biology Research*.

Pearce, F. (2012). Mirage of the Shifting Sands. *Journal of New Scientist, 2 (3) Pp 38-42.*

Pickering, K. T. and Owen, L. A. (1995). *Global Environmental Issues.* London. Routledge.

Snynman, H. A. (2003). *Short-term response in productivity following an unplanned fire in a semi-arid range land of South Africa, Journal of Arid Environ. 39, Pp: 645-666.*

Street-Perrot, F. A. and Perrot, R. A. (2009). *Abrupt Climatic Fluctuations in the Tropics. The Influence of Atlantic Ocean Circulation.* New York. University Press.

Tartenger, W. (2017). *Natural Vegetation:* A Physical Aspects of Geography. Ibadan, University Press.

United Nations (2004). World urbanization Prospects the 2003, revision, United Nations Publication Sales No. E 04 x 111.6