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ENGINEERING RESPONSE IN
COMBATING THE EFFECTS OF

CLIMATE CHANGE IN

AFRICA

- HOW ENGINEERING FREED CHILEAN MINERS
- DRINKING WATER AND CLIMATE CHANGE IN NIGERIA

ENERGY AND THE ENVIRONMENT; ANALYSIS OF THE CAUSES, CONSEQUENCES AND REMEDIES TO DEFORESTATION AND GLOBAL WARMING

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ABSTRACT:

The research paper gives a detail consideration to the relationship between energy and the environment. The paper reveals that; the increasing supply and use of energy has a serious environmental impact both locally and globally, a link which is attributed to the massive increase in emissions of green house gases as the search for alternative energy sources increases. The research is anchored on analyzing the impact of energy utilization on the environment a case study of deforestation and global warming. Attempt was made in this research work to highlights the energy need of the people and the resulting environmental hazards in an attempt to meet up with this huge energy demand. The bedrock of this research paper is to give an indebt revelation into the causes, consequences and remedies to deforestation and global warming which is acclaimed one of the worst environmental problems that is threatening the existence of man.

Keyword: Deforestation, Global Warming, Green House Gases, Energy Utilization and Environment.

1: INTRODUCTION

The importance of energy to our every day life cannot be overemphasized. Energy plays a very vital role in the economic, social and political development of every nation. It is often said that inadequate supply of energy restrict social and economic activities, limits economic growth and adversely affects the quality of life of the people. ^[1] The energy need of man is enormous; apart from the domestic energy need i.e. energy for cooking, heating and drying, energy is also needed for lighting and powering computers and other electronics ^[1]. The importance of energy services is reflected in the association between energy consumption and human development in terms of GNP per capital [Fig 1]. It has also been shown that a strong correlation exist between commercial energy consumption and UNDP Human development index. This index is composed of human development indicator that reflects achievement in the most basic human capacities leading to a long life span [Fig 2]. Energy service matter more than ever in the global fight against poverty, since these service underpin economic growth that provide job in developing countries where they are solely needed.

ENERGY AND THE ENVIRONMENT;

Most economic activities would be impossible without energy, even the small scale village and household enterprise in developing countries that are the main sources of income for the poor in those countries. Thus economic growth that creates jobs and raises income depends on greater access and more efficient use of energy service and their constituent energy resources^[1]. The increase supply and utilization of energy services has serious environmental impact both locally in the form of pollution from cooking fires inside dwelling as well as urban air pollution and globally through massive increase in emission of green house gases. Greater use of fossil fuels resulting from energy generation means increase emission of carbon dioxide [CO₂] the main green house gases [GHGs]. A survey into some rural villages in Nigeria and some Africa countries reveals that Biomass fuels [Fire wood, charcoal and farm residues are the dominant energy source; accounting for about 85 – 90% of the total energy consumed and for about 98% of the total energy used in the rural household sector. Per capital commercial energy [Electricity and Petroleum] consumption is very low relative to the per capital biomass consumption. The overwhelming dependence on wood fuels for energy, clearing of land for agriculture and commercial logging are greatly contributing to environmental degradation such as high deforestation and soil erosion^[4]. The percentage contribution of the different energy sources is shown in [Table 111]. It could be seen that, in order to meet the high rural energy demand for domestic application, there is extreme dependence on biomass fuel hence the resulting effects of environmental degradation such as deforestation which consequently leads to desertification. In urban areas, the story is different as most of the energy are derived from the burning of fossil fuels [Kerosene, Gas and Coal] which remains

the highest sources of green house gases. Discussed in this paper are; highlights into the relationship between energy and the environment, analysis of some of the climatic change caused as a result of our huge demand for energy, the effects of rural / global energy problems, deforestation and finally the issue of global warming^[4].

2: CLIMATIC CHANGES CAUSED BY INSATIABLE DEMAND FOR ENERGY 'AN OVERVIEW'

Energy use, agriculture and deforestation in developed countries has to date largely driven increase in green house gas emissions but much of the future growth in emission will be in developing countries. Forecasts of increase in energy use under a *Business As Usual scenario* which assumes the continuation of historical trends into the future, and that the structure of the global energy system remain unchanged would see world primary energy demand expand by almost 60% from 2002 to 2030, an average increase of 1.7% per year. Insatiable demands for energy are threatening the delicate ecological balances of tundra ecosystem and their wide life. The removal of all trees by the rural people in order to meet their enormous demand for energy, destroy animal habitat, causes severe deforestation resulting to acute desertification and greatly accelerates erosion problems adding to the sediment loads of rivers and making seasonal flooding much more severe. The huge amount of carbon dioxide given off the atmosphere during burning adds to the green house effect which subsequently leads to global warming^[5]. The main driver of the green house gases is the rise in carbon dioxide from the burning of fossil fuels. The main sources of green house gases in order of global importance are; electricity generation, land use changes [particularly deforestation], agriculture and

transport. Climate change, pose issue for continued growth in the use of fossil fuels that for more than 200 years have been the most convenient and cost effective fuels for economic development – and are likely to continue to have cost advantages [excluding any consideration of possible externalities] in some important uses for a long period to come. As the impact of climate change disproportionately affects the health and well – being of the poor, the agenda is of global issue of mainstream importance to the poverty – reduction and economic development agenda. Climatic change is a serious and urgent issue. The global mean surface temperature has increased by about 0.6 degree Celsius over the last 100 years, and is projected to increase by a further 1.4 to 5.8 degree Celsius by 2100. the spatial and temporal patterns of precipitation have already changed, sea levels have already risen by 10 -25 centimeters during the last 100 years, glaciers are retreating world – wide and the thickens of sea ice in the Arctic has decreased. It could be seen from the above analysis that attempt by men to meet up with their huge energy demand has completely brought about an alteration in the balanced natural environment. First the falling of trees caused by over dependence on biomass has resulted in severe deforestation, lost of wide life, desertification and extinction of improved varieties of plants and animal. Under normal condition, the level of carbon dioxide in the atmosphere remains constant and trees absorbed the same amount of carbon dioxide that people produced. But in recent decades, our planet has supported more people and fewer trees, leaving an excess of carbon dioxide in the atmosphere. The excess amount of CO₂ has been on the increase yearly resulting to an imbalance to the carbon cycle. Secondly the burning of fossil fuels especially in the urban cities has led to enormous release of green house gases into the atmosphere. The

net effects of this whole increase could be a world wide rise in temperature estimated at 2^oC to 6^oC [4^o to 11^oF] over the next 100 years. Warming of this magnitude would alter climate through out the world, affects crop production and cause sea level to rise significantly. If this continues, the overall consequence could be disastrous^[6].

3: EFFECTS OF RURAL / GLOBAL ENERGY PROBLEMS

According to the rural energy study, it was found that biomass and human were the overwhelmingly dominating sources of energy. Major uses of biomass [firewood, bio – waste energy is for cooking [Three stone stove in households and rural industries]. Light is provided by kerosene [wicked lamp] in few places, candle and wood sticks. The problems of rural energy are complex and have been long recognized, some of them includes: More than 90% of lighting is through wicked lamp using kerosene, more than 98% of rural energy for cooking and providing heat comes from burning wood and crop residues resulting to increase depletion of biomass which subsequently damage the environment resulting from severe deforestation^[7].

4: DEFORESTATION: CONCEPT, CAUSES, CONSEQUENCES AND REMEDIES

4.1: Meaning of Deforestation

Deforestation is an environmental problem that is happening in many places, and affecting the whole world. Deforestation is the destruction or removal of rainforests. The removal of the forests may seem like it affects only the immediate surroundings, but it really affects the world as a whole. In regions where deforestation occurs there is an influx in the temperature extremes. There is no shade during the day, and no insulation during the night. Once the trees and shade are gone, the once moist soil soon becomes dry and cracked. This leads to flooding and erosion.

There is nothing to absorb the rainfall and no roots to hold the soil in place. To understand why deforestation is such a pressing and urgent issue, forests must first be given credit for what they bring to global ecosystems and the quality of life that all species maintain^[2]. Tropical Rainforests presently give a place to call home for 50% - 90% of all organisms, 90% of our relatives, the primates, and 50 million creatures that can live no place but the rich rainforests. Not only are other species at risk, but the human race also benefits from what the trees give. From something as minor as the spices that indulge food to life giving medicines, the rainforests amplify and save lives^[3].

4.2: Causes of Deforestation

Human-induced deforestation and forest degradation are mainly the expression of forest exploitation in search for wood fuel, intense and growing competition for land and a number of failures or imperfections of the market, the policy and the institutional environment. Thus, pressure on forest resources resulting from increasing demands for industrial products [Lumbering] and fuel wood is still one of the main causes of deforestation in many countries. The pressure will grow in the future since the demand for industrial wood is expected to expand by 56% in the next fifteen years. Another of the more devastating forces behind deforestation is cattle grazing. With the international growth of fast food chains this seems to be an evident factor in the clearing of trees today. Large corporations looking to buy beef for hamburger and even pet food seek cheap prices and are finding them with the growth of cattle grazing. As the burger giants of industrialized society are making high demands for more beef, more forests are being torn down. Statistics from less than a decade ago, 1989, indicate that 15,000 km squared of forests are used expressly for the purpose of cattle grazing

(Myers 32). Once the trees are gone the land is often overgrazed^[4]. The estimated rate of tropical deforestation is shown in [fig 3 and Table 1]. Another acute cause of deforestation is the institutional weaknesses of many of the Government agencies, particularly in developing countries. Perhaps one of the most important institutional weaknesses is the vulnerability of government officials to corruption, understood as "the sale by government officials of government property for personal gain

4.3: Consequences of Deforestation

Deforestation leads to multiple societal and environmental problems. The immediate and prolong consequences of global deforestation are almost certain to threaten life on Earth. Some of these consequences include: loss of biodiversity; the destruction of forest-based-societies; and climatic disruption. Deforestation is causing a loss of biological diversity on an unprecedented scale. Although tropical forests cover only six percent of Earth's land surface, they happen to contain between 70% and 90% of all of the world's species (Myers, 12). As a result of deforestation, we are losing between 50 and 100 animal and plant species each day (Myers 12). Another huge problem of deforestation is its contribution to the greenhouse effect. The greenhouse effect is when gases in the atmosphere trap the sun's heat causing global warming. Unfortunately carbon dioxide is one of the gases that contribute to the greenhouse effect. Since three quarters of the deforestation is due to the burning of the forests, the burning of trees accounts for a quarter of the carbon dioxide that is released into the atmosphere each year. Summarily, deforestation leads to the following^[2]:

1. Desertification
2. Erosion
3. Global Warming and Green house

effects [Burning of trees]

4. Extinction of Species and Alteration of the balanced carbon / water cycle

4.4: Remedies to Deforestation

The following are the possible remedies to the problems of deforestation:

1. Effective government policy on forest regulation.
2. Provision of Sustainable and Affordable energy source.
3. Grazing Regulation
4. Use wood sparingly. [Through energy-efficient stove]
5. Plant Indigenous trees

5.0: GLOBAL WARMING; CONCEPT, CAUSES, CONSEQUENCES AND REMEDIES

5.1: Meaning of Global warming

Global warming Armageddon or bust; some sees the issue as a precursor of global Armageddon; other sees it as a mere hype, but the truth lies somewhere in between. Over time, the amount of green house gases particularly carbon (IV) oxide release by man into the atmosphere via burning of wood and other activities has quadruple. This scenario has changed the natural equilibrium which has existed between the amount of ultraviolet rays released from the sun and the quantity of it that is reflected back to the earth. The likely explanation to this is that; as the dose of carbon (IV) oxide increases, more rays of long wavelength that ought to be reflected back to the sun are trapped to remain within the vicinity of the earth causing an abnormal rise in the mean annual temperature. This is the Global Warming Concept.

5.2: Causes of Global Warming

Carbon dioxide is a major by-product of fossil fuel combustion; others include SO₂ and methane from

the burning of coal. It is what scientists call a greenhouse gas. Greenhouse gases absorb solar heat radiated from the earth's surface and retain this heat, keeping the earth warm and habitable for living organisms [Fig 4]. Rapid industrialization through the 19th and 20th centuries, however, has resulted in increasing fossil fuel emissions, raising the percentage of carbon dioxide in the atmosphere by about 28 percent. This dramatic increase in carbon dioxide has led some scientists to predict a global warming scenario that could cause numerous environmental problems, including disrupted weather patterns and polar ice cap melting^[5].

5.3: Consequences of Global Warming

1. The global warming has led to increase in mean earth surface temperature and thus melting of polar ice. There are frequent melt down of glaciers that result in floods and other natural calamities. The melting of ice at the poles had led to increase in the mean sea level due to increasing mean earth surface temperature.
2. The effect of global warming is very evident on the plant animal kingdom also. Some animals have become extinct due to loss of their natural habitat or their inability to evolve to the rapid changes in the climate. Also there is serious destruction of plant due to drastic seasonal change

5.4: Solutions to Global Warming

1. There are two major approaches to slowing the buildup of greenhouse gases. The first is to keep carbon dioxide out of the atmosphere by storing the gas or its carbon component somewhere else, a strategy called carbon sequestration. The second major approach is to reduce the production of

greenhouse gases. The simplest way to sequester carbon is to preserve trees and to plant more. Trees, especially young and fast-growing ones, soak up a great deal of carbon dioxide, break it down in photosynthesis, and store the carbon in new wood^[6].

2. Government and international policies banning the use of halogenated compounds as refrigerants and also encourage solar energy which is environmentally friendly. Nuclear energy, though controversial for reasons of safety and the high costs of nuclear waste disposal, releases no carbon dioxide at all. Solar power, wind power, and hydrogen fuel cells also emit no greenhouse gases. Someday these alternative energy sources may prove to be practical,

6: CONCLUSION

To reduce environmental degradation, and for humanity to save its habitat, society must recognize that the environment is finite. Environmentalists believe that, as population and their demands increase, the idea of continuous growth must give way to a more rational use of energy, suitable exploitation of the environment, but that this must be accomplished by a dramatic change in the attitude of the human species. Whatever a society's attitude may be towards continuous growth, humanity should recognize that uncontrollable attack of nature and its resources threatens human survival. Humans must watch the way and manner they attack the forest in search for energy, grazing and burning; they must control the rate at which they flare gases as these are the major producers of greenhouse gases.

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