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Afforestation: A Mitigation Strategy to Control Climate Change in Nigeria.

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Abstract

Climate change occurs when a situation in which a change in climate continues in one direction at a rapid rate and for an unusual long period of time. Several studies have shown that afforestation in Nigeria could have both positive and negative future impacts on the climate change and extreme events in the country. While afforestation reduces the projected global warming and enhances rainfall over the afforested area (and over coastal zones), it enhances the warming and reduces the rainfall over the north-eastern part of the country. Afforestation has been implemented worldwide to address global environmental problems such as climate change. This review study considers some impacts afforestation have on climate change such as,reduction in soil biodiversity, desertification, temperature changes and the sequestration of carbon .

Considering the positive impacts of afforestation, the study recommends that government of states should enforce the policy on afforestation as a mitigation measure against climate change.

Key words: Afforestation, Climate change, Mitigation, Carbon sequestration, Green house gas.

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1.0 Introduction.

Many studies now focus on how to adapt to climate change or mitigate the impacts, especially, in developing countries like Nigeria where the vulnerability is high as a result of high rate of deforestation due to population boom. Afforestation (or reforestation) is proposed as a major mitigation/adaptation option to the climate change (IPCC2007). Carbon sequestration reduces the deposition of green house gases in the biomass thereby reducing global warming.

Various climatic parameters affect different sectors of the economy such as agriculture, health, water resources and energy etc. Anthropogenic (human) activities have been the major cause of climate change. For example, the increased industrialization in the developed nations has led to the introduction of large quantities of greenhouse gases (GHGs), including carbon (IV) oxide (CO2), methane (CH4) and nitrous oxide (N2O) into the atmosphere. The consequence of present changes we are experiencing is a steady and general increase in temperature (Akamigbo, 2010). There are evidences for longer droughts in the tropics and the sub-tropics, increasing frequency of heavy rainfall events on most land areas and for increasing intensity of tropical cyclones in North Atlantic (Prabhakar, 2008). Several studies have asserted that rural farmers' are aware of increase and change in length of seasons, incidence of environmental hazards such as flood, droughts, and crop failures, long term shift in wind speed, change in rainfall intensity and uncertainty of rain etc. (Morghadiya and Smarden, 2011) but most are not informed on the mitigation policies due to government inefficiency in the country.

This review study highlights the benefits of afforestation in Nigeria, with the aim of presenting an acceptable policy to mitigate climate change in Nigeria and the surrounding countries.

2.0 Forest and Carbon Sink-The Role of Afforestation.

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Afforestation and reforestation are crucial to the sustainability of environmental stability. The environment within which man lives continues to experience changes the world over due to the exploitation of forest resources (Udofia *et al*, 2007). Among the human activities that have striking effect on the earth's environment is deforestation this can only be corrected by afforestation and reforestation efforts.The main driver of climate change that has occurred since the industrial revolution and population explosion is deforestation which is predicted to accelerate over the next century.The main human influence on global carbon flows is the emission of approximately six billion tons of carbon per year from the combustion of fossil fuels, human impacts on soil and vegetation are also significant (IPCC 2007). Less than10% of carbon (approximately 100 billion tC) iscycled between the forests and the atmosphere yearly, through the naturalprocesses of photosynthesis, respiration and combustion (Steffen *et al*, 1998).it has been established that land use change is a significant cause of CO2 emissions, evidence have shown that sustainably managed and non-managed natural forests are important carbon sinks. Evidence from experiments across a range of forestsfrom tropical, temperate and boreal regions show that forests are currentlya net sink of CO2, absorbing up to 25% of global fossil fuel emissions (Malhi *et.al*, 1999). Fig 1 explains how deforestation contribute to the increase of carbon dioxide in the atmosphere, it also depicts the effect of respiration in the contribution to the total Co2 released in the absence of adequate green environment.

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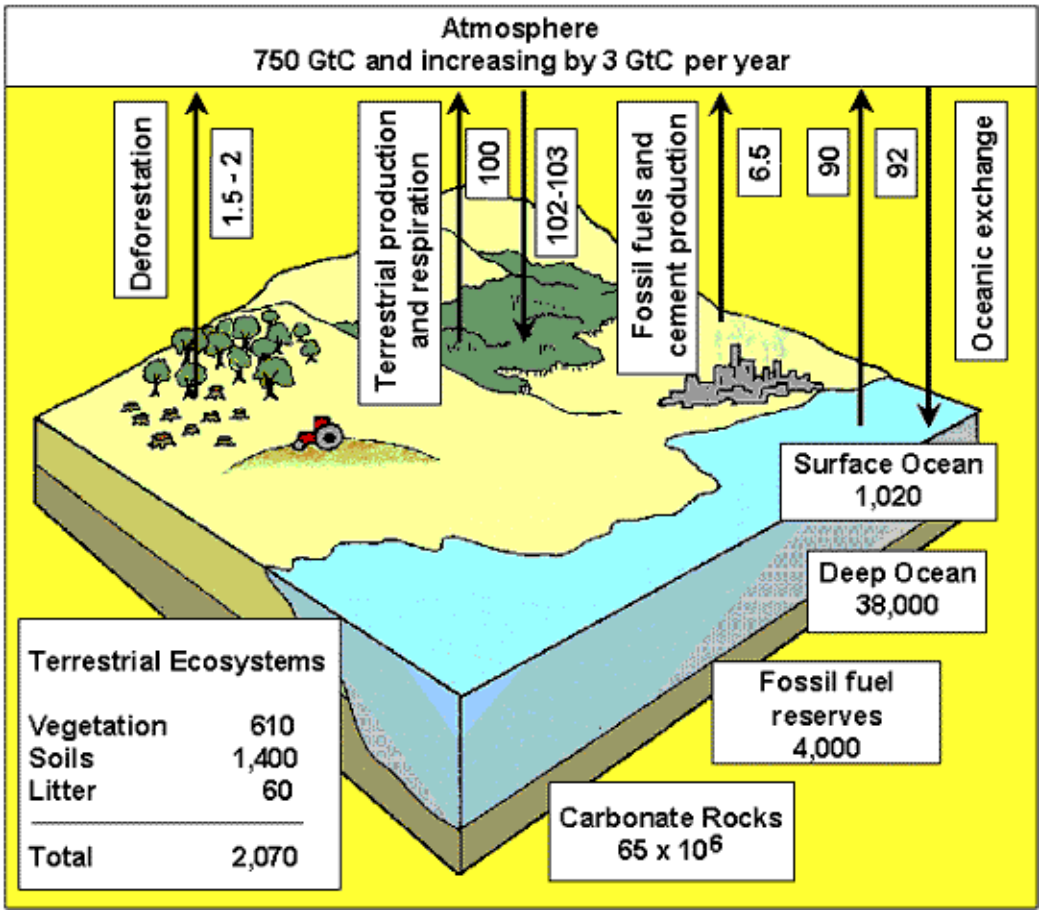
Fig 1: Forest and Climate change



Source: Fao.org 2001

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3.0 Environmental Health Benefits of Afforestation.

The presence of Forests and trees have been noted to supply ecosystem services that help in creating healthy living environments and in restoring degraded ecosystems. Forests has played a major role apart from the supply of non-timber forest products for example in the mitigation of floods, droughts, and the effects of noise, purify water, bind toxic substances, maintain water quality and soil fertility, help in erosion control, protect drinking water resources, and can assist with processing wastewater. Forests can mitigate climate change and may help in regulating infectious diseases. Forest environments promote humans' mental and physical health in many ways: forests help in reducing stress and in recovering from fatigue, and generally forests strongly enhance both psychological and physical rehabilitation (Ulrich, 1983). Forest visits may strengthen the human immune system (Li *et al*, 2008). Reports from studies showsthat when compared, natural environmentsimprove human mood states than urban environments concentration and performance and likewiseproduce positive changes in human physiology afterstressful or attention-demanding situation (Laumann K *et al*, 2003, Hartig *et al*, 2003). Several studies show, for example, lower levels of blood pressure, heart rate, skin conductivity, and muscle tension in natural environments than in urban settings (Laumann K *et al*, 2003). Also, green space near home improves perceived general health and longevity (Maas J *et.al*, 2006).

Tree and plant extracts contain a variety of bioactive compounds such as polyphenols (including flavonoids, phenolic acids,tannins), phytoestrogens (including lignans), stilbenes, carotenoids, sterols, etc. which possess biological activities such as anticancer activity, antiatherogenic, and

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antioxidant potential (Kris-Etherton *et al*, 2002,Holmbom, 2007 and Moutsatsou, 2007).Fig 2 below shows how climate change mitigation can impact the well-being of human via carbon sequestration, food control, provision of medicine etc.

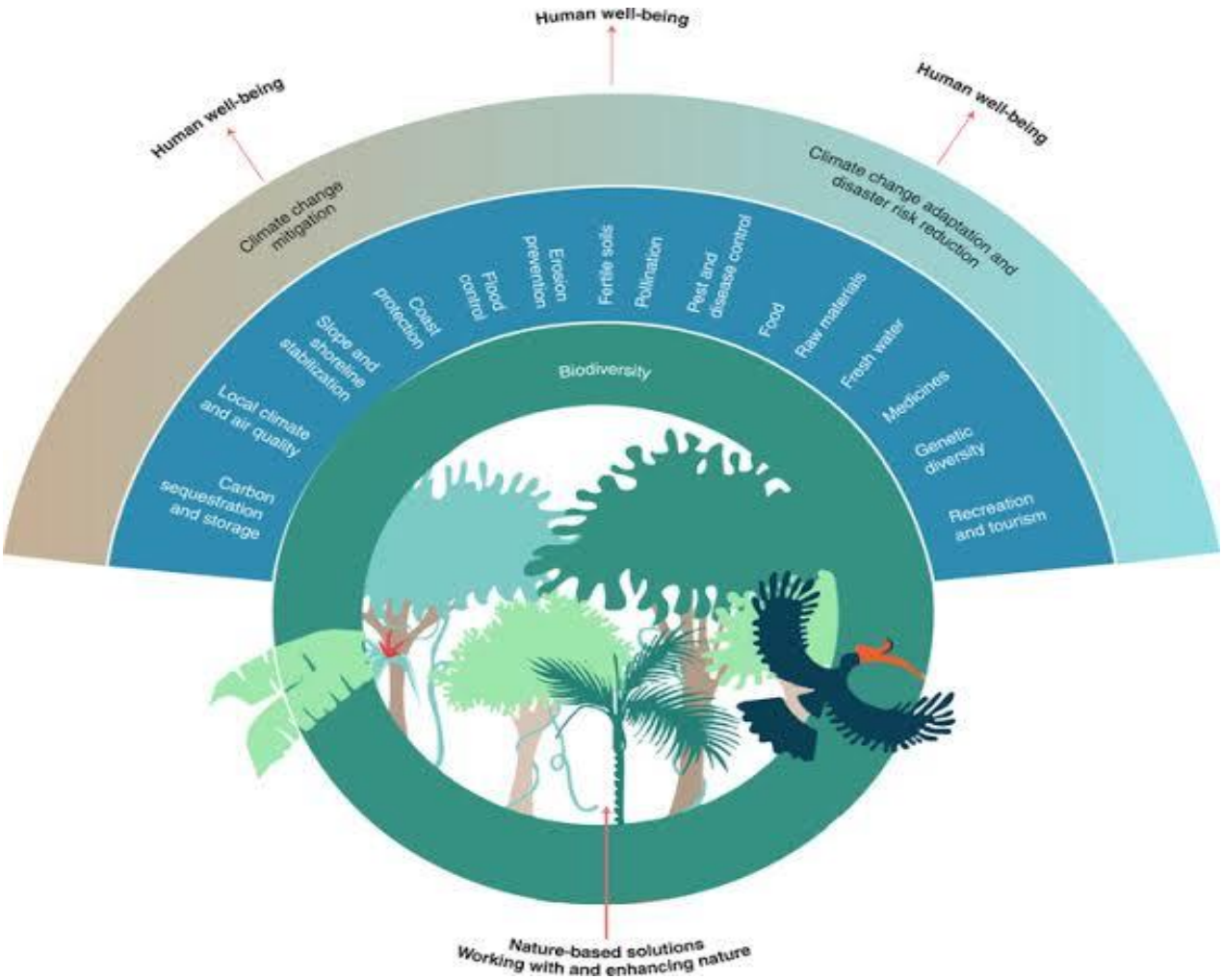

Fig 2: Image showing the impact of Climate change on Human well-being.

4.0 Mitigation and adaptation to climate change - The Role of Forestry.

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The direct and indirect effects of climate change on our soil demand that apart from making strong efforts to prevent additional adverse impacts, efforts to adapt to the impacts already occurring should be made.Successful adaptation to climate change is sustainable forest management with a climate change focus and serious risk assessment. Some of the presented management recommendations are also consistent with the voluntary management guidelines for planted forests from the FAO (2006) and important general principles for forest management and forest conservation under climate change (Bolte and Ibisch, 2007).

The 2007 IPCC fourth assessment report presented the state of the art on the science of climate change and provided new insights on the wide range of adaptative responses available to respond to climate change. Two sets of measures have often been advocated for in confronting climate change. These are mitigation measures (such as reduction in the emissions of greenhouse gases and black soot) to prevent degree of climatic change from becoming unmanageable; and adaptation measures (such as building irrigation systems and adjusting agricultural practices) to reduce the harm from climate change that proves unavoidable. While mitigation seeks to limit climate change by reducing the emission of GHGs and by enhancing 'sink' opportunities, adaptation aims to alleviate the adverse impacts through a widerange of system-specific actions. Oladipo (2008) stated that a variety of options for mitigation (reduction of green house gases) exists in agriculture; they fall into three broad categories – (a)reducing emission of CH4, CO2, and nitrous oxide through efficient management of the flows of these gases in agricultural and other ecosystems (b) enhancing removal of CO2 through improved management of forestry and agro ecosystems and (c) avoiding (or displaying) emissions.There are many forest management strategies which can reduce global CO2 emissions. For example, preventing deforestation and unsustainable agricultural and land-use practices is "one of the most cost-effective and environmentally beneficial actions that canbe taken now to arrest global climate changes" (Hughes and Benemann, 1997). It is apparent to note that there are three main possibilities for mitigating climate change using affforestation: (1) employing activities that reduce GHG emissions fromforests; (2) activities that help maintain the ability of forests to storecarbon; and (3) activities that expand the capacity of forests to store carbon.

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5. Conclusion

To reduce GHG and the effects of global warming planting of trees in open lands and forestation of deforested regions should be critically considered to mitigate the impacts of climate change. Apart from climate change mitigation, afforestation has also been noted to play a crucial role in balancing environmental health. This is achieved via carbon sequestration by storing atmospheric carbon for future use .

Recommendation

It is here by recommended that deforestation as a result of timber falling and housing or farming purposes should be controlled to reduce the risk of climate change.

The recommendations of (AIAE, 2009) should also be followed: A bill for the establishment of National Climate Change Commission (NCCC) in Nigeria with the mandate to deal with all climate change issues should be created.

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