Natural Climate Solutions in a Developing Economy: the Case of the Nigerian Niger Delta

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Authors’ contributions

This work was carried out in collaboration among all authors. Author KO designed the study and wrote the first draft of the manuscript. Authors EI and GS supported with literature. All authors read and approved the final manuscript.

ABSTRACT

The response to climate change depends on level of technology, socio-economic factors and location. In this regard, interventions especially in developing countries may be different from the advance countries. This is more so as climate change interventions in developing countries will require economic empowerment to reduce poverty, promote food production and enhance nutrition. The human threat to climate change adaptation and mitigation in developing countries is not deliberate, but as means of daily livelihood and survival. In order to address the issues of climate change on sustainable bases, survival factors will be considered. In low technology environment as in Nigeria, natural climate solutions are top priority. The context of natural climate solutions is very wide and will depend on local conditions of well-being and environment. The Niger Delta of Nigeria is devastated by crude oil prospection/exploitation and climate change. It is agrarian and the vegetation is Rain and Mangrove Forests. The bulk of the Rain Forest has been degraded due to climate change leading to irreversible grassland called derived savannah, with severe socio-economic consequences. The Mangrove Forest is devastated by climate change and the crude oil industry, with prospects of rehabilitation. In both cases, the natives are helpless and survival instinct leads to further degradation. The application of suitable natural climate solutions will address poverty and ensure sustainable forests. The objective of this paper was to present agro-based local intervention measures to enhance quality of life of the natives and ensure sustainable environment.

Keywords: Natural climate solutions; developing economy; environment; Niger Delta.

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1. INTRODUCTION

Climate change is irreversible change in weather factors. It is attributed to combination of human and natural factors. It is noteworthy that the atmosphere was formed mainly by gasses released to earth space due to activities within the hearth of the earth [1]. Gasses condensed to form water giving rise to water bodies. The activities of aquatic organisms gave a boost to the envelope of gasses called atmosphere. There was eventual separation of land from water giving rise to terrestrial organisms with man at the peak of living things. It is noteworthy that this trend has different phases of stability and instability since creation. Until recently, the earth has attained some stability with predictable weather trend even by mere visual assessment. Within the past fifty years or more, the earth has witnessed visible instability with changes in weather patterns. What are the likely outcomes of instability? How do we adjust for sustainable life on earth?

The outcomes of instability are changes in weather patterns, changes in vegetation, changes in land forms and changes in biodiversity including loss of biodiversity. The threat to biodiversity has no preference for or against any living form. The less mobile and less adapted life forms are the first victims of climate instability. Sometimes, even when a population may not be totally lost, the quality of life can reduce. Despite mobility of some life forms, the instability in climate leads to significant events in the form and function of life on earth. Unfortunately, mobility is no longer an option for man because of emergence of nation states with well defined boundaries. As cross boarder migration is restricted, in-country migration also has its challenges of social dislocation and vices. Movement due to unfavourable conditions has given rise to uncontrolled urbanization, migrants, refugees, internally displaced persons and non-indigenes leading to social displacement and social stigma. It is therefore necessary to provide suitable adaptation measures in situ to check migration. Several authorities have postulated that climate change induced migration with social challenges will assume severe humanitarian crisis by 2030 - 2050 [2, 3].

Natural climate solutions refer to methods of capture of green house gasses where application of engineering techniques is highly reduced. In this regard, it is dependent on the ecosystem [4]. Harnessing natural applications varies with level of technology, socio-economic development and environment. Location specific natural climate solutions are necessary to make such recommendations community based. The Nigerian Niger Delta is characterised by climate change induced degradation of Rain Forest leading to derived savannah, degradation of Mangrove Forest, land and water degradation due to combined effect of climate change and crude oil activities. The attendant deprivation has led to youth restiveness, social vices and vulnerable women that require intervention. The objective of this paper was to highlight natural climate solutions applicable to the Nigerian Niger Delta.

2. NATURAL CLIMATE SOLUTIONS

Some of the natural climate solutions within the scope of rural and agrarian communities of the Nigerian Niger Delta are as follows:

i. Groves: these may be sacred groves kept intact as devoted to some god(s). In some groves, no human activity, including hunting is allowed. The gods are appeased when this local regulation is violated. Prohibited groves are rich sources of biodiversity, and can be assessed and studied through the natives.

ii. Avoid forest conversion: the forests are rich in biodiversity. In this regard, virgin forests should be left intact. There are incentives to conservation of forests such as the Reducing Emissions and Forest Degradation (REDD+) as in Cross River State within the Nigerian Niger Delta [5], Carbon credit and Carbon trading. Examples of conserved forests are the forest reserves [6].

iii. Natural forest management: this refers to planned exploitation of forest resources either through time, space, resources or combination of any of these factors. This can be planned at community or government level. Some authorities advocate fortification of natural forest systems as a priority [7].

iv. Natural peatland conservation: natural peat refers to accumulation of partially decay organic matter. Natural peatland is rich accumulation of organic Carbon. Other advantages of natural peat are rare species may inhabit peatland and it has high water holding capacity. Natural peatland may be associated with wetland as it is in the Niger Delta. It may also be source of history of
mankind especially in archaeology. Peatland should be left intact as reservoir of Carbon. Intensive peatland conservation is possible [8].

v. Peatland restoration: degraded peat land can be restored by spreading chopped wood, surface dress with grass mulch and enhancement with biochar. Drainage outlets may be blocked to conserve moisture. Simila et al [9] provided several methods of peatland conservation.

vi. Fuel wood: a major homestead practice is the use firewood as source of fuel for cooking. This leads to deforestation as trees may be felled for this purpose. Some may argue that dead wood is used instead of live trees. This situation denies the system the opportunity to recycle its waste through decay, as Carbon in ash will be more mobile than peat or soil Carbon. In addition, there are several wood species such as the rubber tree (Hevea spp.) that will burn with ease, even with its moisture content. Mothers are encouraged to use alternative sources of domestic fuel rather than wood.

vii. Farm practice: even if agriculture may be implicated in climate change, it also offers options to mitigate climate change through sequestration of green-house gasses. In addition, agriculture provides adaptation through climate resilient varieties, climate tolerant agriculture for food and nutrition, and socio-economic empowerment of climate change induced vulnerable communities [10]. The subject of climate change agriculture is extensive but in summary, the following methods are hereby recommended: intercropping of annual crops, intercropping of annual and tree crops, tree farming, agroforestry, tree planting, controlled grazing, etc [11].

viii. Reforestation: the Rain Forests are degraded by combined factors of climate change and human activities. Loss of Rain Forest without prospects of recovery, even when left fallow is visible in the Niger Delta [12]. This has given rise to the concept of derived savannah, where the forest landscape has been replaced by grasses and shrubs due to degradation (Fig. 1-3). Reforestation is therefore, on the premise that the forest has been significantly degraded without prospects of self-recovery. The consequence is loss of the economic value of forests, loss of micro-climate of reduced temperature and increased humidity created by forests, loss of water bodies, loss of biodiversity, loss of means of livelihood, etc. The threat to livelihood leads to social problems of migration, prostitution, high profile crimes, vulnerable communities etc. Reforestation may be carried out as tree farming, intercropping of annual and tree crops, and agroforestry.

ix. Forest restoration: this is when the forest is in state of transition towards loss of forest ecology, with prospects of recovery. In this case, the threatened forest can be assisted to recover. The assistance for recovery may be by protection against further exploitation to enable the forest regain the forest climax or assisted. When assisted, economic trees may be planted to enhance the economic value of the forest on recovery. Forest restoration is appropriate to enhance biodiversity conservation including wild life. The forest is though assisted to recover, yet it ensures sustainable resources for the forest dependent communities with regards for structure and diversity of the forest system [13]

x. Blue agriculture: this refers to agricultural value chain in water bodies such as the oceans, seas, rivers, wetland, etc. The Nigerian Niger Delta has potentials for fishery, edible and aquatic crustaceans (shrimp and crab), snailry etc. Blue ecosystem provides sinks for green-house gasses

xi. Agro-processing: this may be farm gate, intermediate or finished products. Farmers may not exceed farm gate and intermediate processing, as finished products often involve heavy machinery. Farmers apply processing techniques but may be abused leading to poor quality produce. Training on processing hygiene is necessary, including avoidance of harmful substances such as chemicals and disease vectors.

eren. Protect mangrove forest: like the Rain Forest, mangroves are also degraded due to human activities and climate change (Fig. 4 - 6; Carugati [14]). It is noteworthy that mangroves provide rich biodiversity and Carbon sink. Recommended measures for the mangrove forests are protection, restoration and reforestation [15].
Fig. 1. Rain Forest

Fig. 2. Derived savannah

Fig. 3. Rubber tree plantation

Fig. 4. Undisturbed mangrove

Source: from the internet
4. CONCLUSION

An overview of natural climate solutions suitable for the Nigerian Niger Delta is provided. This region consists of six states and constitutes the South-South geopolitical zone in Nigeria. The stability of this agrarian population is necessary for meaningful livelihood and contribution to climate change mitigation and adaptation. These suggested measures will enhance economic well-being of the natives and for sustainable environment in this region.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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