A Paradigm Shift in Climate Change Education in Sub-Saharan Africa: Lessons from Lake Chad

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Introduction

The dynamics between anthropogenic modifications of the natural system leading to regional climate change have not been given enough attention by the majority in sub-Saharan Africa. This is partly because the frequent linkage of climate change to carbon dioxide (CO_2) emission from fossil-fuel burning does not ignite any sense of anthropogenic contribution in a continent that is energy poor. Even when the link between deforestation and increased CO_2 is made, absence of cheap, low carbon-fuel alternatives is hampering response at the local level. Articulating a measured response to climate change in sub Saharan Africa is also competing with other equally urgent crises arising from poor governance, social conflict, poverty and high disease burden, particularly from HIV/AIDS and malaria. In the context of these set of problems begging for attention, this paper will seek to answer the questions: Should countries in sub-Saharan Africa worry about climate change or should they rather channel their scarce resources to the intractable socio-economic crisis? What are the most critical cultural practices that can be used to sensitise sub-Saharan African countries on making sense from the 'nonsense' of climate change? It proposes a paradigm shift in climate-change education using descriptive analysis anchored on science on how traditional farming practices have contributed to the drought in the Lake Chad Basin.

It is generally agreed today in most developed countries that climate-policy decisions driving future greenhouse-gas mitigation effort will strongly influence the compliance with Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC) – avoiding Dangerous Anthropogenic Interference (DAI) with the climate system.[i] For countries in sub-Saharan Africa, understanding the consequences of DAI on the already impoverished region is key to any mitigation effort. Presently the western model of climate-change education has failed to resonate in the region. An alternative approach should be based on climate-change science influenced by local culture. The drying up of Lake Chad presents a unique setting integrating indigenous practices and modern science to explain climate change. The 17th United Nations Framework Convention on Climate Change (COP 17) to be held in Durban, South Africa from 28 November to 9 December 2011, offers a great opportunity at explaining this different approach.

Socio-Economic Consideration

The first aspect in trying to understand the forces operating in the sub-Saharan African region is knowing that the story of Africa from the last century till date has been a story of conflict. From the ravages of many civil wars to the rivalries of selfish military dictators and religio-ethnic conflicts, Africa has always evolved and is still evolving in opposition to the challenges presented by the rising level of poverty, AIDS, integration in Africa, economic/political reform, corruption, sham democracies, environmental degradation and the high energy costs.

Certainly, the enormous challenges posed by poverty, lack of access to health facilities, safe drinking water and basic infrastructure demands immediate attention. However, the argument that tackling the aforementioned

challenges should supersede that of climate change simply because climate change is too far out of sight suffers some fundamental flaws.

This is so because all the models of the future climate-change scenarios have projected that Africa is the most vulnerable region to climate change due to the extreme poverty, frequent natural disasters such as droughts and floods and its overdependence on agriculture.[ii] Some of these stresses will to a large extent be exacerbated by climate change. So, knowing how a farmer in a remote village at the bank of Lake Chad contributes to local climate change and how it directly affects his crop yield is crucial.

Anthropogenic Contribution to Climate Change

As an important component of the earth system, the land surface plays a vital role in the global climate system through interactions with the atmosphere.[iii] A suggestion explaining droughts in the Sahel region was first introduced by Charney.[iv] His study demonstrates that desertification results generally in droughts by a positive feedback between land and atmosphere caused by increasing surface albedo. Albedo being the fraction of solar energy (shortwave radiation) reflected from the Earth back into space. Albedo increases with deforestation, grazing and biomass burning all of which are associated with farming practices in LCB. Thus, climate variation from biomass burning and land-use changes has a profound impact on hydrology and water resources availability. The shrinking of Lake Chad can be attributed to a number of drivers to include changes in land-use pattern, climate change and mismanagement of natural resources by the local population.

So, knowing how a positive feedback from slash-and-burn farming practice leads to decrease in precipitation (hence drought) is a better explanation of changing climate to a local farmer than trying to explain how the released carbon dioxide from biomass burning contributes to global warming. In the former, the cause and effect is felt directly by the farmer with the severe consequences of drought on crop yield. In the later, however, the link between carbon dioxide and global warning appears invisible and too global as direct consequences of biomass burning to be understood.

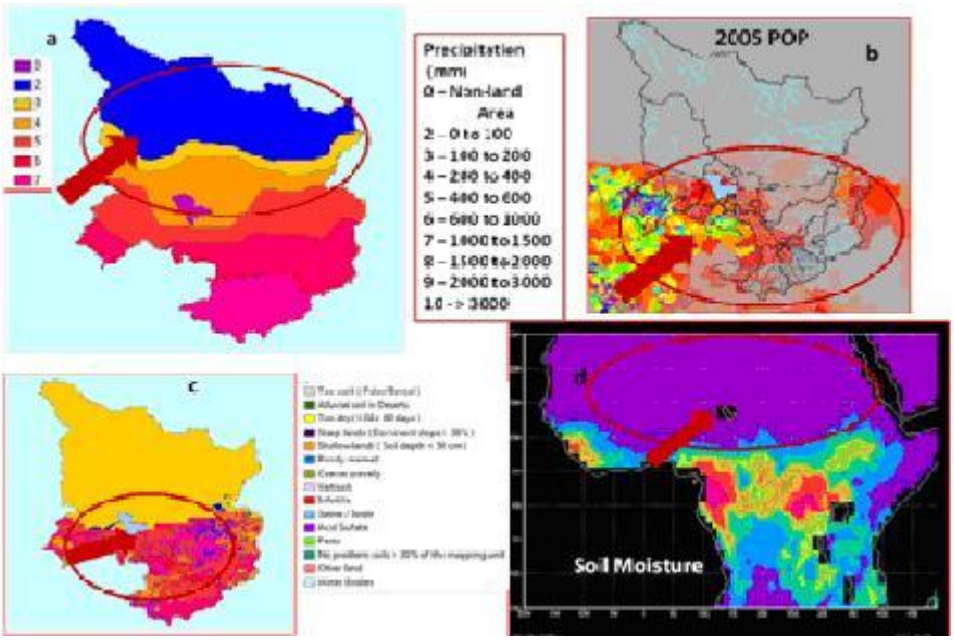

Fig 1: (a) Precipitation, (b) population density, (c) Problem land and (d) Soil moisture of Lake Chad and surrounding basin showing: the interception of Lake Chad Feeder Rivers, high population density, low moisture content and problem land.

Figure 1 above shows the interception of Lake Chad Feeder Rivers, high population density, low precipitation and

low moisture. It can be seen that LCB suffers from chronically overburdened water systems under increasing stress from fast-growing urban areas and intense cultivation. In response to the reduced availability of freshwater resources, communities living in the banks of Feeder Rivers have resorted to diverting rivers for irrigation purposes. Also, as the population increases around the Feeder Rivers, there is an increased stress on water resources hampering access to freshwater from both surface and groundwater resources. As the number of farmers in LCB increases with population, more pressure is exerted on the quality of soil available for cultivation. Increasing population also means that enough time is not given for the vegetation to recover which may result in temporal or permanent loss of vegetation cover and subsequent regional climate change (figure 2).

By explaining the role of these land-use changes in altering surface fluxes of water vapor to the atmosphere which in turn exerts a strong influence on the water balance of the LCB, leading to reduced precipitation and changes in local climate, the local population will start making sense of climate change 'nonsense.' Also, climate-change education should be incorporated in public works program in developing countries originally focussing on emergency situations like drought, flooding and soil conservation.

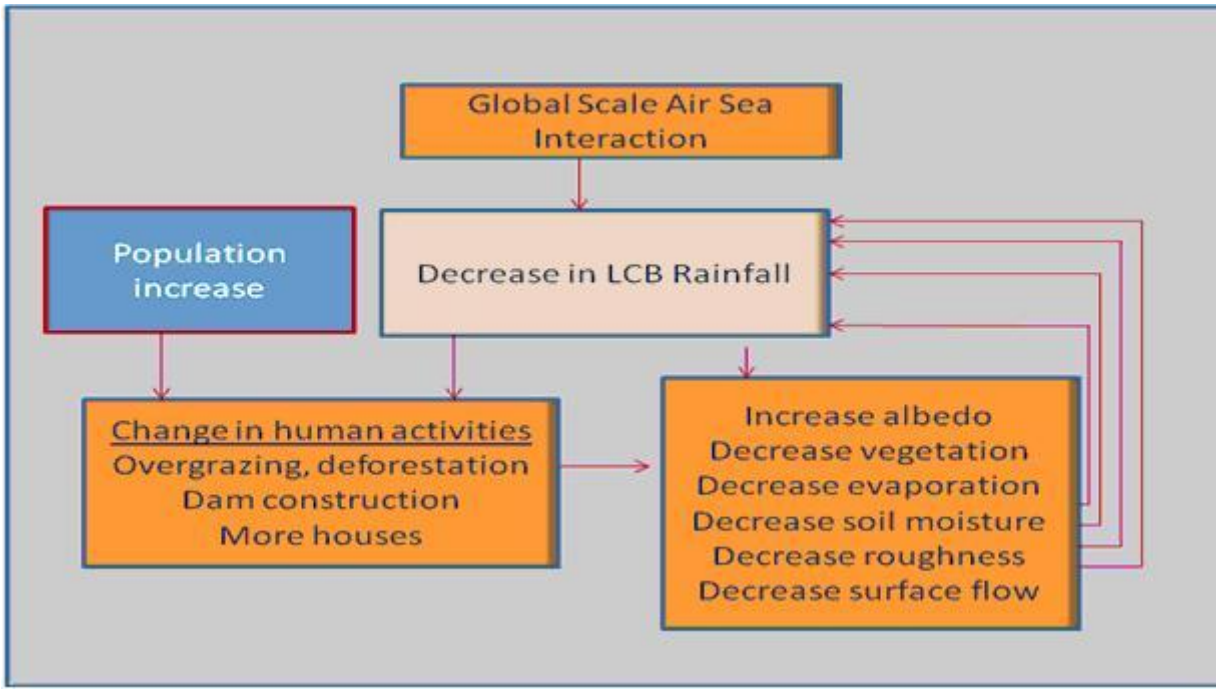

Fig 2: Schematic of Anthropogenic Impact on Precipitation

As shown in figure 2, the cycle of long drought resulting from deforestation and bush burning through cut-and-slash farming practices will drive home the consequences of local climate change than trying to explain carbon dioxide role in global warming. Similarly, the role of dust build up (aerosols generation from bush burning) from year to year in modulating meteorological dynamics in the Sahel region as well as the effect of diabatic heating from biomass burning on water-vapour generation and atmospheric circulation has direct link to the cultural practices and day to day activities of the local population.

In the Final Analysis

Sub-Saharan African countries can make better sense of the 'nonsense' of climate change by simply knowing that vegetation influences climate and of course that climate also influences vegetation. They need to know that deforestation leads to powerful feedbacks between land surface and the atmosphere that reduces precipitation and changes planting season. Sensitisation will be more effective if the local population understands that when

precipitation and/or temperature are too low, desert biomes dominate (as in the Sahara).

In the final analysis, while admitting that the challenges of poverty, disease control, failure of the political structure and near absence of growth and economic development calls for urgent action, the climate-change challenges should nevertheless be integrated into policy decisions. The drought in Somalia is a warning sign of what the impact of regional climate change will mean for the continent's poor. The COP 17 to be held in Durban presents a golden opportunity to sensitise sub-Saharan African countries on the nature of anthropogenic impact on regional climate. A way forward needs to integrate and address the consequences for poor and hungry people. It thus makes sense to start making policy decisions that will not only put the region on the right path to sustainable economic growth and development but that sub-Saharan African countries should and must start worrying about the wider implications of regional climate change on these problems.

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[i] IPCC 2001, Climate Change, 2001, Synthesis report, A contribution of working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, pp. 398.

[ii] G. Hagman, "Prevention Better than Cure", *Report on Human and Environmental Disasters in the Third World*, Prepared for the Swedish Red Cross, Stockholm, 1984.

[iii] J. Shukla and Y. Mintz, "The Influence of Land-Surface Evapotranspiration on the Earth's Climate", *Science*, 214, 1982, pp. 1498-1501.

[iv] J.G. Charney, "Dynamics of Deserts and Drought in Sahel", Quarterly Journal of the Royal Meteorological Society, 101, 1975, pp. 193-202.