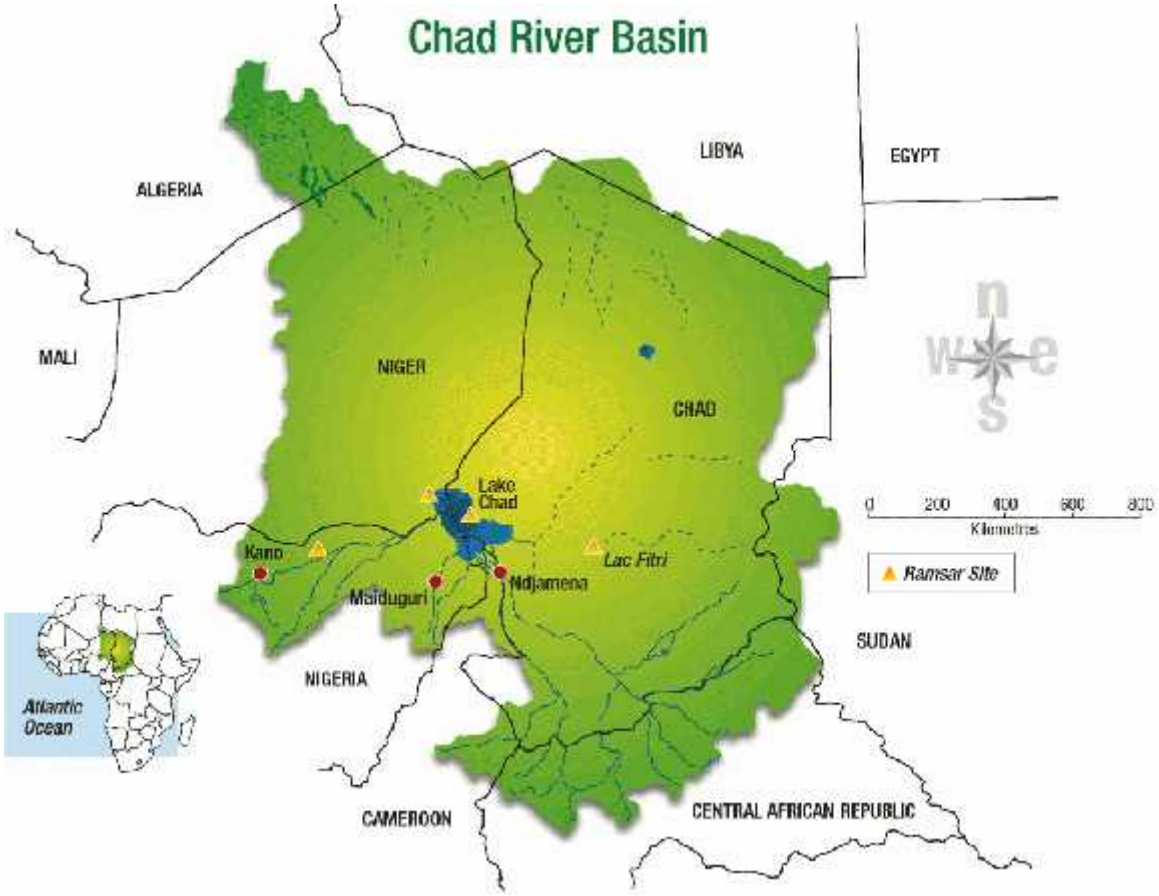
Abstract

Lake Chad, a source of life for more than 30 million people has shrunk by 95% between the 1960s and early 2000s. This put a strain on the livelihoods of the people in the Sahel. Though the size of the lake has recently increased, the effects of climate change are still making life difficult for people in the region. This essay suggests ways to address the problem of climate change in the Lake Chad region through education, a regional space program and the use of space enabled Information Communication Technology.

Space as a tool to address climate challenges: examples from local communities.

Mallam Yinusa; a northeastern Nigerian Fulani, semi-nomadic herdsman attended schools located along official grazing routes in the 1960s. However, due to changing climate patterns, the education of his grandson – Musa is at risk as his family is forced to move farther away from grazing routes in search of fodder for their dwindling cattle, a common scenario in the Lake Chad region.

Figure 1: Image of Chad river basin showing Lake Chad

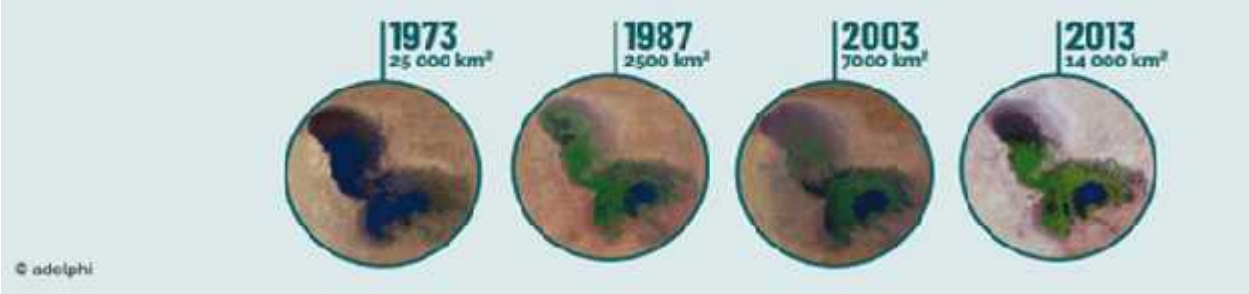


Source: infocongo.org

Lake Chad, a shallow body of freshwater located in west-central Africa at the conjunction of Niger, Chad, Cameroon, and Nigeria is critically important for 30 million people in the Sahel (FAO 1973). It was severely affected by the Sahel droughts of the 1970s and 1980s. In 2000, the size of the lake was down to 1,304 km^2 from 22,902 km^2 in 1963 (Bojang & Ndeso-Atanga 2010). The United Nations Environment Programme (2018) opines that the lake's decrease is due to shifting climate patterns and high demand for agricultural water. Climate change and the increasing scarcity of resources are intensifying the violence between agriculturalists and

pastoralists and adding flames to the Boko Haram terrorism conflict of the region (Vivekananda et al., 2019). The Lake Chad Basin Commission (LCBC), established in 1964 by the leaders of Nigeria, Cameroon, Chad and Niger and later joined by Libya and the Central Africa Republic in 1994 and 2008 respectively alongside its partners (Egypt, Sudan, the Republic of Congo and the Democratic Republic of Congo) continue to make efforts at mitigating the impact of its shrinkage on people's lives.

Figure 2: Lake Chad's water level fluctuations



Source: NASA Goddard Space Flight and adelphi

Contrary to popular reports, Lake Chad is thought to have increased from 1304km^2 to 14,000km^2 in the last two decades but it is still greatly affected by climate change. Temperature in the Sahel is rising 1.5 times faster than the global average (ICRC 2019), droughts and floods are becoming longer and more frequent which is undermining food production and livelihoods. Because of the shallowness of the lake and higher ambient temperatures, vegetation cover is increasing; this is slowing water movement and hindering fishing and boat transport. These changes are feeding a misleading perception that large parts of the lake have disappeared or become a vast swamp (Vivekananda et al., 2019, p.41).

The implications of climate change, along with the Boko Haram terrorism conflict, internal migration and increased pressure on natural resources in the Sahel have contributed to a 60% decline in fish production, degradation of pasturelands, and farmlands by 80% and a threat to biodiversity (FAO n.d). The increasingly variable weather patterns that have emerged in the region over the last decade have increased uncertainty over the longevity, timing and strength of rainfall and drought. There is also concern from the increase in crop-damaging insects and livestock diseases (Vivekananda et al., 2019). Collectively, these shifts are making it more difficult to plan livelihoods.

Space technology is simply the application of engineering and science to the utilization and exploration of outer space. Utilizing space to address the Lake Chad crisis requires a multi-faceted approach. Capacity building comes first. The affected countries should provide accessible and quality education for people in the region with a focus towards the current realities. At the tertiary level, students should be sponsored to study related courses such as

meteorology, remote sensing, satellite applications, hydrology, aerospace engineering and space law at local and international universities with regional collaboration on projects such as cubesats. This will enable human capacity development in the long term.

Joint space programs by countries in the region should be started to better monitor the Lake Chad basin. A joint space program will ensure lower launch and hardware costs and easier funding options, it is also better than launching multiple space programs for the same purpose and will enable a wider range of capabilities than what is currently obtainable. Earth observation satellites such as weather satellites should be launched to complement the grossly inadequate synoptic weather stations in providing more reliable rainfall prediction, to assist the farmers, herders and fishermen plan their operations, improve food security, flood mapping and ensure better early warning and preparedness against climate shocks. Vegetation satellites optimized for the region should also be launched to monitor the extent of desertification in the Sahel, map out new grazing routes, and plan reforestation programs to reclaim arable land for agriculture. Only two countries- Nigeria and Libya-in the LCBC have national space programs, a regional space program will serve as a learning opportunity for the others. The African Space Agency should be involved to monitor this project and formulate a space policy that is fair to all countries involved.

An effective method of disseminating hydrological and weather information will be needed to ensure it gets to the priority users. This can be achieved through provision and training on how to use ICT equipment such as mobile phones which can be used to achieve the growing of climate sensitive crops. Farmers who use their mobile phones are likely to sell two or more crops due to better access to weather and climate information (Vivekananda et al., 2019). Other measures include the dissemination of detailed weather forecasts by internet to agricultural extension officers to prepare the farmers so that crops can be sown and harvested accordingly. Communications satellites should be used to provide internet connectivity in the most remote locations of the Lake Chad region via sustainable business models to encourage better use of ICT by farmers.

In conclusion, using space technology to mitigate the impacts of climate change in the Lake Chad region will be of immense benefit to more than 30 million people in the Sahel. Development through proper education of people like Musa, the utilization of space technologies as well as international cooperation amongst affected countries are required to ensure the protection of livelihoods, increase resilience against climate change and provide relevant information needed for climate change adaptation strategies.

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