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Think Piece
Human Vulnerability to Depleting Water Resources in Cameroon: Sensitisation approaches

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Introduction

The ecological diversity of Cameroon is linked to its geology, morphology and climate. This diversity is unique, not only in the central African region, but on the African continent as a whole. It ranges from wetlands along the Atlantic coast in the south, through equatorial rain forest, to savanna in the Sahel, and then to desert scrub in the southern fringes of the Sahara Desert at the extreme northern end of the country around Lake Chad (Figure 1). This uniqueness is also reflected by the variations in the culture of the people who speak over 250 languages.

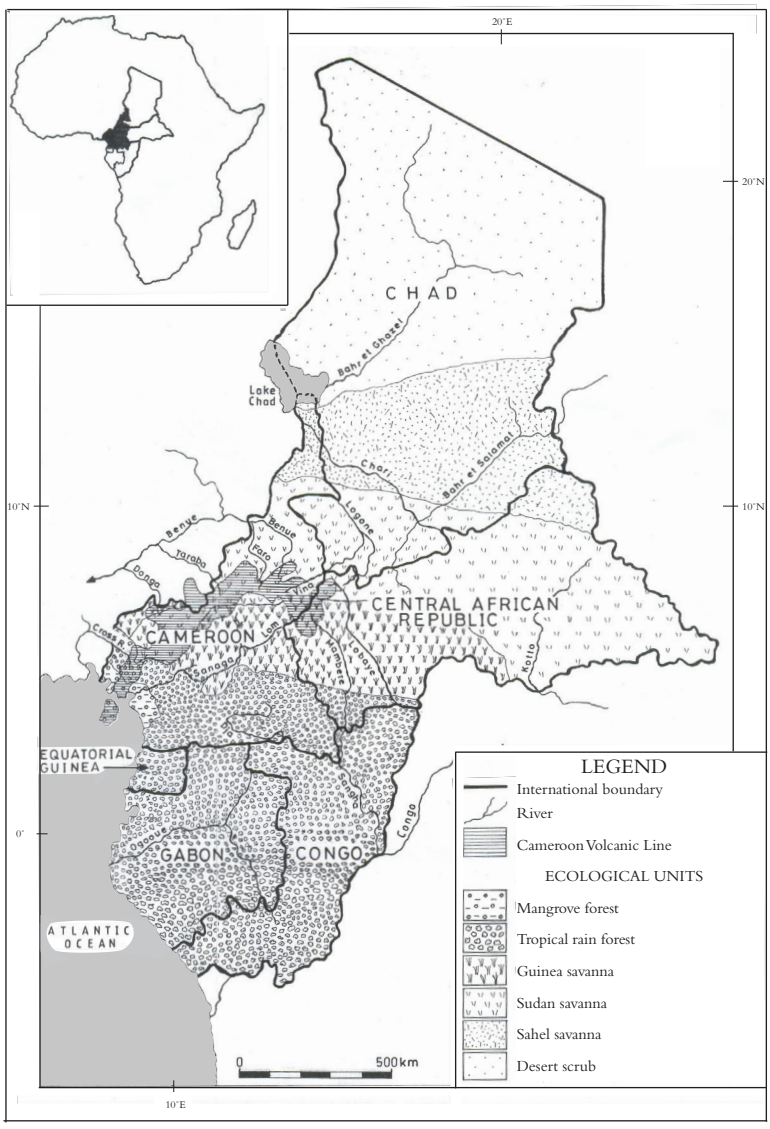
The determinant factor for the distribution and concentrations of both urban and rural populations, as well as their livelihood, is accessibility to water supplies. The potential of these resources is dependent on the types of aquifers which, according to Ayonghe (1998), are recharged by rainfall in sedimentary rocks, fault zones in Precambrian crystalline rocks, weathered Cretaceous granites and Tertiary volcanic rocks. Phreatic aquifers constitute the main catchment areas in the country, especially along the dominant morphological high termed the Cameroon Volcanic Line. According to Ntasin and Ayonghe (2001) rivers radiate from this major catchment in all directions (Figure 1). The groundwater within this main catchment area has, over the past few decades, been observed to be under stress – as indicated by the depleting volumes of water in the rivers. Complete or total disappearances of perennial springs, leading to dried-up streams and drastic decreases in the volume of rivers, especially during dry seasons, are common (Ayonghe, 1998). In fact, hydrogeological events within the last 10 years have left almost every critical hydrological observer with the conclusion that the stock of water resources in the country has been declining. The marked reduction in the size of Lake Chad, located at the northern end of the country, the growing potable water crises in both urban and rural communities, the reducing volumes of water in nearly all rivers leading to shortages of electricity supplies from hydroelectric generating stations, and the increasing southward migration of communities from the north, are also strong pointers to the fact that a major water crisis is looming. Consequently, there is need to pay urgent attention to this problem.

This paper constitutes a critical review of the causes of the depleting water resources, the trends related to some of the causes, projected impacts in the near future, and the possible impacts of such trends.

The results are used to propose possible approaches to, and challenges for, environmental education aimed at highlighting potential adaptability approaches that could be used to reduce the vulnerability of the population to these changes. Problems related to approaches of raising

awareness are discussed. A proposal is put forward for considering a lifelong learning process involving the most affected communities in order to ensure the preservation of their cultural heritage even when they are forcefully displaced (from excessive arid conditions), rather than allowing them to be caught up as refugees before they attempt to adapt. Approaches of sustainable water management options are proposed as the most appropriate mitigation actions that could either slow down or reverse the situation, with an associated suggestion that such strategies become the focus of environmental education programmes.

Figure 1. Ecological zones of Cameroon within the Central African Region, and the Cameroon Volcanic Line catchment



The State and Uses of Water Resources in Cameroon

Water is an essential resource for both plant and animal life. Fresh water is a precious resource and those who have it in abundance take it for granted, but when the resource starts depleting in quantity, it renders them vulnerable. Water use varies for each locality and according to a World Bank Report (1998; cited in Nji & Fonteh, 2002), from 1970 to 1998, 46% of fresh water in Cameroon was used for domestic needs while 35% was for agriculture purposes.

Most of the people in Cameroon are farmers. Large areas within the main catchment region of the country (e.g., the Adamawa Plateau, the Mandara Mountains and the Western Highlands) have been used for extensive agricultural systems. Such agricultural activities account for more than 70% of deforestation, especially on the Bamenda Highlands where most of the montane forest occupying peaks of topographic highs has disappeared (Ndenecho, 2007). In the past, these forests served as effective watersheds which ensured sustained regular water flow from perennial springs.

Irrigation farming systems along the Logone and Chari Rivers (which flow northwards into Lake Chad), when associated with dams used for abstraction of water for the cultivation of rice, are responsible for the dwindling volume of the water downstream into this lake. The surface area of the lake reduced from 25 000km^2 in the 1970s to barely 2 500km^2 today, a tenfold reduction in barely 30 years. Similar impacts of water abstraction from streams and rivers for rice cultivation are also evident in rice projects along the middle reaches of the Sanaga River and at Tingoh along the Menchum River.

It has also been demonstrated that inappropriate farming methods lead to reduced water retention capability (Dudal, 1980). Pastoral farming within the watershed has been shown to reduce infiltration after rainfall due to the trampling effect from high intensity grazing within these areas (Amawa, 1999).

The expansion of both urban and rural settlements within major watersheds in the main catchment region of the country is also responsible for the depletion of the water resources in these areas, as paved surfaces and farmlands have replaced the ideal forest which favoured infiltration, resulting in the disappearance of most springs, even during the rainy season.

Water Resources Depletion: Causes and impacts

Weather conditions such as rainfall and temperature have been considered to be some of the environmental (natural) factors which affect groundwater resources in the country (Ayonghe, 1998). Other factors include deforestation, overpopulation, overgrazing, uncontrolled farming practices and the planting of eucalyptus trees (Lohman, 1990; Ayonghe, 1998; Amawa, 2001). Environmental changes have led to irregular and/or low precipitation patterns (Ayonghe, 2001). Over the last few decades, these changes have manifested themselves as drought, and sporadic climatic changes which have led to geo-hydrological disasters such as floods and landslides. Using the coefficient of determination, Amawa (1999) discovered that 16% of the decrease in the discharge of springs over a 30-year period was accounted for by this trend of reduced rainfall.

Other impacts of depleting water resources include desertification, famine, loss of biodiversity, and migration of communities to greener areas. In the Sahel region of the country (Figure 1) it is common to find people and cattle tussling over existing stagnant water resources during the peak of the dry season. Such tussles usually lead to fatal conflicts and, together with high cattle mortality rate, often force people to migrate to more humid areas (Eze, 2001). In rural communities of mountainous areas, close to 40% of water problems are common during dry seasons and periods of drought (Acho-Chi, 1983).

In the coastal region, excessive overpumping of groundwater from wells located in unconfined aquifers during the dry season usually leads to a drop in the water table, resulting in saline water intrusion to contaminate the freshwater resource (Engome, 2006).

Sensitisation Approaches and Challenges for Environmental Education

A variety of water harvesting techniques have been implemented as an approach aimed at remedying the situation within the Sahel region where precipitation is generally low (Nji & Fonteh, 2002). The results have been encouraging, with increased water supplies to communities for longer periods of the year. This success is however limited to regions with unconfined aquifers. Other approaches will therefore have to be considered for areas without such aquifers.

The future availability of this precious resource can be ensured if appropriate approaches of Sustainable Water Resources Management (SWRM) are adopted. According to Hirji and Malapo (2002) this encompasses two related components which are in a dynamic tension and which must be brought to balance: the utilisation of the resources for the various human needs while at the same time protecting them in order to ensure continued utilisation by present and future generations.

Government policies have, over the years, been focusing on ensuring provision of adequate potable water to both rural and urban communities. Although the cost has been enormous, the success rate has been far from satisfactory, especially in cases where groundwater is targeted for such provision.

In order to ensure the effective implementation of SWRM approaches in the Cameroon context, it will be necessary to use various environmental education approaches to involve and sensitise user communities in the effective sustainable management of this precious resource. Although such involvement and sensitisation will be locality or region specific, the overall approach could be similar across the entire country.

The following issues are considered for such programmes:

(1) The water cycle and its importance
(2) Watershed/catchment areas: Their importance, methods of conservation and protection (management)
(3) Aquifers: Types, and management options
(4) Surface and groundwater quality considerations
(5) Human pressure being exerted on water resources: The need to reconsider past uses and habits

(6) Climate change and its impacts on depleting resources: Future trends of these changes and projected consequences
(7) Examples of successful SWRM options in other parts of Africa (e.g., SADC) and other arid areas of the world with emphasis on the need to adapt instead of becoming an environmental refugee
(8) Participatory design of policy options and legal framework

The sharing of knowledge amongst both urban and rural communities about water resources and best management practices, through discussions and educational programmes, could ensure the sustainable management of this precious resource which, from observed trends, is dwindling in quantity and quality at an alarming rate especially during the past few decades. Generally, good management of even scarce water resources can generate sufficient supplies to communities.

Catchment/watershed management programmes stand out as the most crucial aspects of this approach but, regrettably, this consideration is completely absent from the official water policies of the country, leaving these areas vulnerable to human-induced degradation activities. With an ever-increasing demand for this resource by both urban and rural communities, the current trend of migration of communities southwards to greener pastures is simply a postponement of the problem. Instead, an understanding of the nature of the resource, causes of its depletion, and remedial approaches to be considered, could, in some cases, restore this resource in localities where springs have dried up. This is essential since the underlying aquifers are intact and only require favourable surface conditions for adequate infiltration.

Conclusion

By opting to stay, learn, accept and adapt to natural (environmental) changes affecting water resources, communities will be more able to preserve their cultural identity and heritage. In this way, they will be more able to preserve their livelihood, and ensure effective industrial development, sustainable growth, food security and poverty alleviation, instead of being affected by the insecurities of migration to new and sometimes hostile regions to start new lives as environmental refugees. This, in our view, is the challenge for environmental education in a changing world!

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