
Lake Nyos Gas Disaster: A Socio-Economic Assessment of its Impact, 1986-2018

Vitalis Song Yamsa

Department Of History And African Civilizations

University Of Buea

Email: Songvitalis@gmail.com

Tel: 651267007

Abstract

This paper examines the socio-cultural and economic implications of the 1986 Lake Nyos gas emission in the North-West Region of Cameroon as well as the various schools of thought that surrounded this gas emission. Firstly, it examines the various schools of thought proposing explanations for the gas emission before considering how the disaster impacted the people and environment around the lake. The paper argues that the causes of the Lake Nyos gas emission of August 1986 remain contradictory and that it negatively impacted socio-cultural and economic activities in the affected areas. This paper relied on oral interviews with some selected victims of the gas emission and other secondary sources like books and articles in peer reviewed journals.

***Keywords:** Disaster, Displacement, Resettlement, Rehabilitation*

Introduction

A disaster can be defined as a sudden accident or catastrophe of nature or human action, which overwhelms local resources and threatens the safety of the community. Disasters are the ultimate test of a community's emergency response

capability.¹ Response to natural disasters is sometimes difficult to plan and anticipate because they are innately different from common emergency events.² When disasters occur, there are severe casualties, loss of lives and property, widespread displacements and sometimes, resettlement for safety. In this regard, for a community to survive the effects of a disaster be it natural or man-made, a disaster plan that is adaptable to multi-disciplinary and multi-jurisdictional situations is needed. Natural disasters are complicated events in which people are subjected to a multitude of risks and dangers. However, every disaster scenario is unique in its own way and presents new and unusual challenges to victims and management initiatives. Disasters can take many forms like bush fires, droughts, heat waves, earthquakes, hurricanes, tornadoes, winter storms as well as lake explosions like that of Lake Monoun in 1984 and Lake Nyos in 1986.

Over the course of time, there have been a variety of disasters. Some of them have really made history because of the devastating long lasting effects. The worry here is that natural disasters are not over and will continue to occur and some of them occur with little or no warning. Even if you get some warning, you do not know the epic proportions that it can reach. In 2005, the some of the southern states of the USA were hit by hurricane Katrina. In 2008, China's Sichuan Province was hit by an earthquake that killed about 87000 people. In 2010, there was an earthquake in Haiti that left many dead and homeless. In 2011, Japan experienced a Nuclear disaster that left millions dead and injured.³

The African continent has not been void of disasters and their consequences. For example, the floods in Algeria in 2001 killed around 900 people and adversely affected many others.⁴ In Eastern Africa in 2002, heavy rain brought floods and mudslides that forced people to evacuate their homes in Tanzania, Uganda, Kenya, Burundi and Rwanda. In 2001, Ghana experienced torrential rain that caused widespread floods in the capital Accra. More than 100.000 homes were destroyed.⁵

A few months ago, after the devastating earthquake in Turkey, it was the turn of Morocco. The country experienced a magnitude 6.8 temblor which left 2,900 people dead and over 5500 injured in addition to the near complete destruction of the town of Oukaimedene near Marrakesh-Safi. At the same time, flooding in Lybia has had a significant impact on the country with thousands dead and another 10,000 unaccounted for. In fact the convergence of climate related disasters, protracted crisis, earth tremors and political instability in African countries creates a lethal cocktail that leaves people and communities grappling with minimal preparedness, inadequate infrastrucrure and limited access to essential services in areas where such disasters occur. Such was the case with the Lake Nyos Gas Disaster in Cameroon in 1986.

In 1984, Cameroon experienced an explosion at the Lake Mououn in the west region of Cameroon and in Lake Nyos in the North West Region in 1986. In 1996, there was a fuel/fire disaster at Nsam in Yaounde and in In 2002, the city of Limbe was a theatre of a series of floods. Of all these, the horrifying scenes of the Lake Nyos gas disaster remain a memorable chapter in the history of the country and the lives of those who survived the incident. The causes of the incident remain controversial given the implications of the disaster on the Nyos people and its environs. This article therefore examines the causes and implications of the gas emission. It is divided into two broad sections. The first section examines the causes of the Lake Nyos gas emission of August 1986. It specifically handles the various schools of thought that surround the cause of the Lake Nyos gas emission. The second part analyses the social, economic and environmental impact of the gas emission on the villages of Nyos, Chah and Subum.

Methodology

This paper employed both qualitative and quantitative instruments. The quantitative instruments were employed to provide statistics on the number of displaced persons and to measure damages caused in some areas. The qualitative

approach was quite relevant because the study required a lot of analyses and fact interpretation. Given the nature of the topic, a chronological approach of data presentation was used. The events were presented as they occurred. With regards to sources, primary, secondary and tertiary sources were adequately exploited. Under primary sources, oral interviews and archival documents were paramount. In conducting oral interviews the following methods were used; individual interviews and focused group interviews were conducted. Face to face interviews were conducted and not the use of questionnaires because majority of the informants were non-literate. There were also some sensitive information on certain issues under study that respondents could not reveal in the midst of others. Group interviews were also used because it gave an opportunity to synthesize the opinions and ideas of the various informants for authenticity.

The target groups were those directly affected and some of the neighboring communities that witnessed the occurrences. Some of the stakeholders involved administrators, traditional authorities and humanitarian workers. The sample population involved both men and women who were selected with consideration of their ages and knowledge of issues under study. For effective information gathering, the researcher employed the use of a tape recorder and in some instances the services of an interpreter were needed because of language barrier. Also, Telephone interviews were conveniently and carefully tracked with the expressed consent of the respondent who could not be physically met to avoid unwarranted ethical issues. Under archival documentation, some intelligence and assessment reports in the Buea National Archives were consulted. From these reports vital information was gathered on the origin and migration of the people. Secondary sources consulted included books, magazines and Journal Articles focused on the key concepts of disaster, disaster management and resettlement persons. As concerns tertiary sources, the internet and documentaries have been produced on the Lake Nyo Gas Emission were taken into consideration.

Origins of the Lake Nyos Gas Emission

On the night of Thursday, 21 August 1986, a limnic eruption occurred in Lake Nyos that released a massive cloud of carbon dioxide gas in the atmosphere. The gas flowed down the slopes and killed 1,746 people and 3,500 livestock while they slept. The disaster occurred without warning and the gas spread over the countryside at nearly 100km/h and suffocated everything in its path.⁶

While this is accepted as the official version of the cause of the disaster, the cause of the Lake Nyos Disaster (LND) has been a longstanding controversy among politicians, everyday people, and (to a lesser extent) scholars. The controversies have been sparked by unbridled debates and feelings that there were distortions of facts on the actual cause of the incident that is reported to have claimed several lives and destruction of property. The debates reveal that three main schools of thought exist on the issue. These schools hold parallel views on the origin of the gas emission and possible impact on the people. I have grouped them into the mythical school, the scientific school and the conspiracy theory school.

The Mythical School of Thought

According to the mythical school of thought, the origin of the Lake Nyos gas emission could be attributed to the annoyance of their prominent chief known by the people as the king of the lake (*Fon njwi*).⁷ The majority of the indigenes associated the incident with witchcraft or mysticism. They consulted sorcerers and witch-doctors in an attempt to uncover the causes of the disaster. According to the mythical school of thought, the LND was a punishment issued by a prominent chief known as the King of the Lake (*Fon Njwi*). Oral evidence suggests that before his death, the *Fon* instructed that his largest cow be used for *kwifon* secret society rituals.⁸ After he died, his traditional council disregarded these instructions and instead consumed the large cow and sent a smaller one for the ritual.⁹ After *Fon njwi's* death, all his cattle moved in a queue along the Lake Nyos. According to some indigenes, this signaled a bad omen which finally manifested in 1986.

Search for Scientific Causes: The International Conference on Lake Nyos

The scientific community gathered at the Yaoundé International Conference on Lake Nyos on March 20, 1987 to consider the causes of the LND. The international conference was sponsored by the United Nations Educational, Scientific and Cultural Organization (UNESCO). In attendance were 117 international and more than 80 scientists from Cameroon, Britain, France, Israel, and America who theorized on the possible causes of the Lake Nyos gas emission.¹⁰ Other participants came from international organizations like the International Red Cross Association, United Nations, World Health Organization and the European Union. In Yaounde, two schools emerged; the volcanological and then limnological. They agreed that the gas emission was related to the concentration of CO₂ beneath the lake.¹¹

The volcanologists¹² were mainly French geologists and scientists and according to them, the gas emission was caused because a high concentration of magmatic materials caused by volcanic activities beneath the crater lake suddenly erupted. The gas emission could not have been predicted because it was a natural incident and was not monitored.¹³ In contrast, the limnologists who were mainly experts from the USA, Israel, Japan, and Britain held that the emission was attributable to the composition of water in Lake Nyos and other deep crater lakes in the area.¹⁴ They argued that gas which had been accumulating in the lake waters for some time was triggered by a landslide or a heavy thunderstorm. The limnological faction suggested that, the lake waters could be tested periodically to give people advance warning of a likely explosion. The limnological school eventually became more widely accepted by the conference participants. Additionally, the entire medical evidence collected by national and international physicians and pathologists indicated that carbon dioxide (CO₂) was the lethal toxic agent. It was reasserted that the emission resulted from the rapid mixing of the CO₂ supersaturated deep water with the upper layers of the lake; the reduced pressure then allowed the stored CO₂ to effervesce out of solution.¹⁵

The Conspiracy Theory

The conspiracy theory holds that the gas disaster was man-made. According to its proponents, the emission was the result of a bomb test initiated by Israel and Cameroon Government officials.¹⁶ Proponents of the conspiracy theory who were mostly indigenes, people living in surrounding villages of Nyos and a few experts. They argued that prior to the explosion, the lake was a very “good Lake” which was intimately intertwined with the people of Nyos. They claimed that a good lake could not suddenly harm the people.

The conspiracy theorists contended that the lake’s dramatic change was certainly due to human action. This belief was reinforced by numerous alleged suspicious happenings in the Nyos area in the months preceding the explosion. According to them, the traditional ruler of Nyos and royal family moved out of the village a few days before the incident making proponents question whether they knew of the forthcoming disaster.¹⁷ It was also alleged that an Israeli geologist had visited the lake to warn people to evacuate. Proponents also noted that, a few days before the incident, the Israeli Prime Minister Shimon Peres visited Cameroon with a plane full of medical doctors, scientists, blankets, drugs for the Nyos area.¹⁸ The conspiracy theorists question the fact that, if the explosion was natural how did the Israelis spontaneously assemble a scientific team and equipment within such a short time? These questions have never been satisfactorily answered, which only emboldens the conspiracy that the explosion was caused by an atomic weapon tested in the lake. One might not be wrong to assert that if the victims were unable to clearly reveal what caused the incident which has evidently left untold impact on the people, then the origin of the incident is yet to be established. The divergent schools of thought all offer their own explanations for the explosion. However, what remains undisputed is that the LND adversely impacted the population and natural environment of Nyos, Chah, and Subum.

The Impact of the Lake Nyos Disaster

The Lake Nyos Gas Disaster had varied consequences for the people of Nyos and its environs. Shanklin frames the Lake Nyos as “beautiful and deadly” because the sudden explosion destroyed the peoples trust that the lake was a “good one”. The magnitude of the impact of the disaster on the victims was very glaring in the post-disaster period. One of the victims affected by the gas emission lamented that:

... Shame unto thee Lake Nyos. Yes, all the children were yours and the air they breathe was yours. Old to dying thou bug lake gathered thy children as in refectory. For an urgent family concertory and under this net thou intoxicate them. Shame though thou reached thy aim...Cameroonians will forget not this instability... the world over holds thee grudge in continuity. Shame unto thee, unto thee shame.¹⁹

This survivor reviews how people had a cordial relationship with the lake before the disaster; the lake made life worth living. Oliver Smith’s theory of political ecology holds that, the relationship between most societies and the natural environment is imbalance since society suffers greatly from natural calamities. To fully grasp the impact of the of the LND, this paper proceeds by examining its environmental, social, and economic implications.

Environmental and Health Impact

The incident had severe ramifications on human and physical environment. Available records show that the violent emission of toxic gas polluted the atmosphere with CO₂ killing people and animals. Rivers, streams and the land were also poisoned by the gases. Water from the river was no longer safe to drink and the ²⁰ contamination led to the death of all aquatic animals. The decaying bodies of animals and humans which remained unburied for many weeks further poisoned streams and rivers.²¹ This spread water-borne diseases like typhoid and cholera which impacted the survivors in nearby communities. Additionally, some neighboring villages unknowingly drew water from the contaminated tributaries.

The Lake Nyos gas emission also polluted the air in Nyos, Chah and Subum. Nearly all people and animals in the affected areas died from inhaling deadly gases like Sulphur Dioxide (SO₂) and Carbon dioxide (CO₂). These toxic gases contaminated the atmosphere and worsened the spread of airborne diseases through coughs and respiratory problems. In an interview, Anthony Jam (68), a survivor from Subum, recalls the aftermath of the explosion:

... when the explosion occurred, I was at Subum where I had built my compound. It smelled like a decayed egg. It made me to feel weak. I was equally unable to breathe well and vomited blood. I felt a sharp pain on my chest. I was then taken to Nkambe for medical treatment by the forces of law and order...²²

According to clinical findings from the Wum and Nkambe hospitals, survivors were often unconscious, and had skin lesions, cough, haemoptysis, dyspnoea, eye irritation, and limb weakness.²³ Table 3 presents the clinical evaluations of survivors diagnosed in Wum and Nkambe hospitals.

Table 1: Clinical Results of Lake Nyos Disaster Victims Diagnosed in Nkambe and Wum Hospitals between 1986 and 1987

Disease	Number of Victims
Cough	262
Haemoptysis	25
Dyspnoea	42
Eye irritation	42
Skin lesions	161
Limb weakness	51
Limb swelling	85
Vomiting	42
Headache	220
Weakness	93
Fever	101
Total	1124

Source: Peter J. Baxter, M. Kapila and D. Mfonfu, "Lake Nyos Disaster, Cameroon, 1986: The Medical Effects of Large Scale Carbon Dioxide?" *British Medical Journal*, (1989), p. 2.

Clinical assessments found that cough (31%) was the most frequent illness among diagnosed, followed by headache (26%) and skin lesions (19%). Some of the victims were deformed, paralyzed while others blind. Survivors are reminded of the LND, not least by the scars of burnt bodies and visual impairments. Almost all of the cattle and domestic animals were lost. Hence poverty became inevitable.²⁴ Azibo reiterates that the environment of Nyos, Chah and Subum bore the most devastating impact of the Lake Nyos disaster. He points out that the gas explosion contaminated the environment with toxic gases that suffocated and killed many and impacted on the health of those who survived.²⁵

Social-cultural Impact

Nyos was one of the main cattle areas in the Menchum Division and the North-West Region. However, the emission killed almost all the cattle and domestic animals, hurling residents into poverty. The number is estimated 5300. In Nyos, Chah, and Subum, the toxification of the air, water and land made the area inhabitable. Consequently, the area became vulnerable to undesirable patterns of social discord, economic destitution, and mass displacement.

Displacement of People and Resettlement Challenges

The incident had intensely negative socio-cultural repercussions on residents. This included forceful displacement and migration away from the affected villages to safer areas in the North West Region and beyond. Records show that about 4,430 persons were internally displaced by the Nyos incident.²⁶ Displacement removed the victims from their material and cultural resource base, means of livelihood and traditional coping strategies and traditional occupations.²⁷ The involuntary movement forced the people into new, often worse, patterns of life. Most of the displaced people migrated to Buabua, Kimbi, Wum, Fundong, and Bafmeng villages. Others moved further away out of fear of another emission. Famine, has presented two tables of forceful displacement of the local population.

Table 2: Temporary resettlement camps during the first week of Lake Nyos disaster

Resettlement camp	Number of survivors
Wum hospital	400
Catholic Mission	215
WADA	245
Kumfutu	289
Bafmeng	907
Mungong	72
Finfuka	202
Mbuh	125
Kimbi	470
Esu	200
Nkambe	259
Mesaje	750
TOTAL	4133

Source: Fomine, 2011, p.3

According to Fomine, Table 1 indicates that a total of 4,133 survivors were resettled during the first week of the disaster. The highest number (907) of survivors was resettled at the Bafmeng camp. Some 125 survivors were resettled at Mbuh, the smallest, resettlement camp. In due course, the government felt it necessary to come out with another programme of temporary resettlement camps (see Table 2).

Table 3: Temporary resettlement camps in February 1987

Camp	Male	Female	Total
Esu	51	64	115
Kimbi	377	406	783
Kumfutu	167	88	255
Wada	124	121	245
Catholic Mission	142	108	250
Misaje	216	212	428
TOTAL	1077	999	2076

Source: Fomine, 2011, p3

Fomine also reveals that Table 2 indicates that slightly more men were found in the temporary resettlement camps of February 1987 than women. Men numbered 1,077 while the corresponding number of women was 999. Also, more survivors were resettled at the Kimbi and Misaje camps. There were 783 survivors at Kimbi and 428 at Misaje. As time evolved, the Cameroon Government deemed it wise to create permanent resettlement sites for the survivors.

According to Fomine, the displacement of persons was a huge challenge which temporary resettlement sites could not serve as a solution. Thus permanent resettlement was the third and major phase of the rehabilitation programme for the Lake Nyos survivors. The prime objective of the programme was to construct permanent resettlement sites and assist the survivors to re-establish normal lifestyles. This emanated from the fact that many of the survivors had become wanderers in neighbouring villages and a nuisance to the local population. They therefore needed to be resettled permanently. The construction of permanent sites for the survivors commenced immediately after the International Conference on the Lake Nyos gas disaster was held in Yaounde from 18 to 20 March 1987. The conference participants made it abundantly clear that the gas-affected site could not be habited in the short term.²⁸ The first sites to be constructed included Ipalim, Yemgeh, Kumfutu, Esu, Waidu, Kimbi and Bwabwa

Fomine has also argued that, the construction of permanent resettlement sites for the Lake Nyos victims had several repercussions. First, several nuclear families were separated because the experts who designed the programme took into consideration ethnic affinity and not marital relations. Even in extended families, relatives were permanently separated by distances measured in tens of kilometres. Second, permanent resettlement sites were expected to have abundant fertile land for crop cultivation and grazing. But ironically, this factor was not adequately taken into consideration and resulted in considerable longer term dissatisfaction with the permanent resettlement sites. The Fulanis suffered most

because their chief economic activity was cattle raising and the land assigned to them for pastoral purposes was insufficient for this purpose.

After drawing the plans of the houses to be built in the permanent resettlement sites, construction work began with the assistance of some able-bodied survivors. The survivors were partially responsible for making the compressed mud bricks that would be used for construction, levelling of foundations and fetching for water. As soon as the construction of the houses was completed, the survivors were lodged in and quickly reintegrated into farming - both crops cultivation and cattle raising - on the limited land assigned to them. The uncomfortable life lived by survivors in the permanent resettlement camps is worth some additional discussion.

Disruption of Cultural and Traditional Institutions

The disaster also impacted on local traditional and cultural practices. Among those who died were traditional leaders, priests and diviners. These personalities or dignitaries played influential customary roles prior to the incident. For example, the chief or Fon performed regular sacrifices at the shrines and also cleansed the land and appeased their ancestors for protection and abundant blessings.²⁹ The death of key figures combined with displacement, meant that no one in the community was qualified nor offer sacrifices. Sources maintain that annual cultural festivals and rituals ceased at the new resettlement sites. The indigenes believed the lake had cursed and attributed their future misfortunes to the disruption of their traditional practices and institutions. In the Buabua resettlement camp, for example, one survivor narrated the implications of abandoning cultural and traditional practices and rituals:

... We no longer bury our relatives in our ancestral compounds...we don't even have shrines here to appease our gods to better our living conditions in this camp. If we are suffering in this camp, it is because we no longer live according to our customs and traditions. Lands that we were supposed to

inherit have been abandoned. We need to go back to our land and live as we were living before.³⁰

The controversial (mis)handling of the LND victims' bodies was an important issue. Like every African society, the indigenes have special funeral rites and post funeral manifestations. The burial would have been performed according to status, gender and age of the deceased. Failure to follow some of these traditional procedures was considered an abomination. Some sources claim that any misfortunes after the incident was attributed to the neglect of the corpses and non-adherence to traditional burial practices. The victims were buried in mass graves, no consideration was made regarding the origin, status and wealth of the victims. Generally, traditional institutions played an important role at burial ceremonies, disconnecting the spirit of the dead from the living and cleansing the land from any suspected evil spirits. Evidently, the failure to perform these important burial cultural practices caused a separation between the living and the dead (ancestors). The impacts of this were observed in many domains, for example crop failure, outbreak of diseases and mass hunger. Atoning to the gods for forgiveness usually requires a massive sacrifice. For example, cattle, food, pigs, salt and palm oil. These items are required to restore links with the ancestors and cleanse the land and restore peace and stability.³¹

Crisis of Identity

The disaster also initiated problems of identity conflict and recognition between the settlers and internally displaced persons. Three main villages affected by the disaster (Nyos, Chah and Subum), but the survivors were dispersed to seven. In the resettled areas, the identity (in terms of land possession, housing and property rights) was questioned by the indigenous inhabitants who considered newcomers to be strangers. They were regarded as strangers. This resulted to incompatibility between the resettled persons and aborigines.³²

The disaster warranted urgent action around the resettlement of victims and the provision of basic amenities like water, sanitation, clothing, shelter, and farming equipment. The victims were eventually resettled at camps located some miles from the disaster site. Interviews with George Tetang, Achi Williams and Julius Tamfru revealed once the victims were resettled, opportunists began squatting in the abandoned areas in the early 1990s.³³ Those who re-occupied the villages came from Kung, Fang and Yemnge. The majority of them were farmers and cattle grazers who needed vacant land. These occupants had no ethnic ties with the dispossessed groups from Nyos, Chah and Subum. Informants revealed that socio-economic conditions at the resettlement sites were generally not good. Many survivors favoured a return to their original villages, especially once they realized that there was no further threat to their lives.

The decision to return to their original villages was also motivated by economic and cultural factors, including ancestral connections with the lake and the shrines in the area. Most of the returnees in Nyos claimed that they were the children of the victims. The return of the original inhabitants ignited tension between the recent occupants (strangers) and the returnees. This situation became gradually more precarious as the strangers sought economic and social recognition for land they did not traditionally possess. This ignited the problem of identity, which seems to have motivated the deterioration of relations between cattle herders and farmers.

Change in Gender Roles and Family Responsibilities

Another social impact of the disaster was the change in gender roles and family responsibilities among survivors. Many families lost their “breadwinners”, meaning roles that were previously performed by men who died were now shifted to women and vice versa. In families who lost both parents, responsibilities were shifted to their children. In most resettlement camps, some widows grieved that the death of their husbands increased their family responsibilities. Hadija Abdu (690 from Subum stated that that:

before the disaster, I and my husband had many cows. The death of my husband and all the cows left me with nothing to cater for my family. Here, I find it difficult to shoulder all the family responsibilities alone.³⁴

The young men, especially the Mborroros lost considerable property (mostly cattle), which they expected to inherit from their uncles and parents.³⁵ In the Nyos village cattle rearing remains the primary economic activity. The massive loss of cattle created problems for many families, as economic resources became scarce. Prior to the incident, cattle, goats, and fowls constituted the principal source of income for most families. Parents could raise money for children's school fees and home maintenance by selling livestock. The loss of livestock especially cattle limited the potential income sources for men. As such women involved in subsistence farming took on some, if not all, household responsibilities.³⁶

Loss of Lives

The greatest impact of the LND was the sudden loss of lives that caused massive population decline in Menchum Division. The gas emission killed at least 1700 people.³⁷ Chemical, geologic, isotopic and medical evidence suggests that victims died of CO₂ asphyxiation. Though the official number of human casualties is widely contested since official counts may not include people who were buried by the villagers before the defence and security forces arrived the scene. Immediately after the incident occurred, the indigenes conducted mass burials. Additionally, interviews at the Ipalim resettlement camp, revealed that many people died shortly after resettlement due to inadequate health care.

Psychological Malaise

LND caused psychological trauma, shock and paranoia. Many survivors lost their whole families; some fell unconscious only to wake up in strage environments. The events at Nyos provoked panic and grief among the victims and the pains inflicted will not be easily forgotten. Some survivors wonder: "how could our ancestors suddenly betray us this way? What did we do to merit such a curse as a consequence?"³⁸ Even at the resettlement camps survivors

were not psychologically healed. It was common to hear them say: “we live like strangers here. We are never at ease with ourselves.” Those who decided to return to their original villages also were living in fear and uncertainty. According to interviews from the field, the returnees at Subum returned to live beside their ancestral graves. Fear and uncertainty made them to be affected and traumatized but were traumatized.

Economic Implications

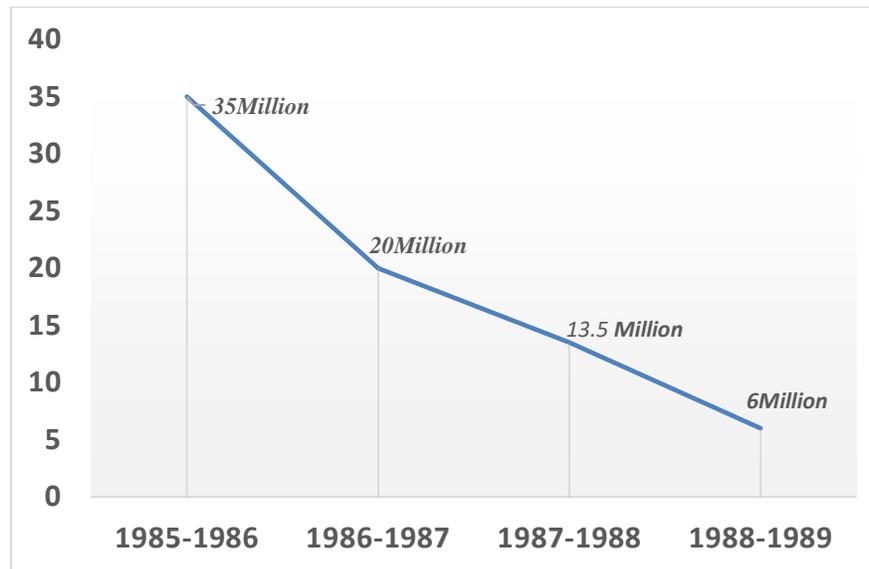
Impacts on the Wum Area Development Authority (WADA)

The Wum Area Development Authority (WADA) collapsed after the Lake Nyos disaster. Prior to the disaster, WADA drove socio-economic development for the whole of the Menchum Valley and the Nyos area. However, WADA could not collect loan repayments from the disaster victims or even the survivors. Other material losses such as equipment and cattle given to herders. WADA definitely incurred huge material and financial losses estimated at over 20 million CFA francs or more. For example, a rice huller and corn mill worth 4,500,000frs that was abandoned in the risk zones.³⁹ This loss incurred by WADA were exacerbated by the economic crisis in Cameroon during the 1980s.⁴⁰ The introduction of the Structural Adjustment Programs had serious repercussions and, in 1987, the president called on WADA. Yielding to a call from the presidency in 1987, called on WADA to reduce its subventions to farmers and forcefully retired staff. The Authority’s budget was reduced from 35 million FCFA in 1885/86 to 20 million FCFA in 1986/87; from 20million francs to 13.5 million FCFA in 1987/88 and all the way down to 6 million FCFA in 1988/89.⁴¹ Table 4 and figure 1 displays WADA’s budget trends from 1985 to 1989.

Table 4: Cuts in Budget Payment of WADA, 1985 to 1989

Year	1985/1986	1986/1987	1987/1988	1988/1989
Budget (CFAF)	35million	20million	13.5million	6million

Source: Kum F. George, “Contending Trends, 2009. p. 10.

Figure 1: Cuts Budget Payment of WADA, 1985 to 1989

Source: Kum F. George, *“Contending Trends, 2009, p. 10.*

While the budget cuts were at the peak of Cameroon's economic crisis, they were caused by the huge losses incurred after the LND. WADA was liquidated on the 13th of January 1989 by presidential decree No 89/037. Kum contends that the cost incurred by WADA during the Lake Nyos crisis greatly contributed to its collapse.⁴² It can therefore, be reaffirmed that the Lake Nyos crisis of 1986 was partly responsible for the collapse of WADA in 1989. The collapse of WADA affected nearly all economic activities in the Nyos area especially agriculture.

Massive Loss of Livestock

Many livestock animals like cattle, goats, pigs, fowls, rabbits, and even birds were killed in the disaster. Ali Sali Abdu (74), a victim from Subum asserted that;

...before the tin bin happen, I bin get 274 cows for Subum, 14 big goats and plenty fowls them... when I been wake up for morning time for that day, all my cows them bedon die when gas e bin comot for Nyos. I bin think say na lightning and thunder e bin kill them whe e bin be na the gas for Nyos.⁴³... before the disaster, I had 274 cows in Subum, 14 goats and plenty of fowls. ...when I got up in the morning on that disaster day, all my cows had died. I thought it was a result of thunder and lightning. Unfortunately, it was a result of the Lake Nyos gas explosion.”

The loss of livestock negatively impacted the individual owners and the broader economy. The above victim lost more than 288 animals as a result of the incident.⁴⁴ Plate 1 graphically depicts the sudden, and massive death of cattle after the gas explosion.

Plate 1: Dead Cattle in the wake of the Lake Nyos Disaster



Source: *Shanklin Eugenia, (1988), p.12*

Table 5 below displays the estimated number of livestock lost in the disaster. The massive reduction of cattle affected the revenue that was gotten through taxes from grazers. The Jangali tax revenue collected from grazers in Nyos, Cha and Subum was reduced by 7,000,000 FRS⁴⁵ and animal transit fees paid to the local councils vanished entirely.

Table 5: Number of Livestock Lost During the LND

Livestock	Amount of casualty
Cows	3,909
Fowls	3,324
Sheep	364
Goats	561
Total	8158

Source: *Kanno F. T, 2003, P.30*

The massive loss of cattle as indicated inflated livestock prices in the area as shown in Table 6 below

Table 6: Changes in the Prices of Livestock, 1970-1990 (FCFA)

Livestock/ Year	1970	1980	1990
Cow	15000	60.000	50,000
Goat	3000	13000	10.000
Pig	5000	8000	7000
Cocks	500	1500	1300
Hens	250	1250	1000

Source: *Kanno F. T, 2003, p.33*

Before the Nyos disaster, livestock was quite cheap in Menchum. A goat could be purchased for about 3000 FCFA, a cock fowl for 500 and hens for 250 FCFA), while cattle cattle 15000 FCAF. Because livestock rearing was mainly for subsistence, only surpluses were sold to the market in Nyos or exchanges for other commodities. Additionally, currency was more powerful at that time. By 1980, the prices of these commodities were relatively stable. However, from August 1986 to 1990, there was a sharp increase in livestock prices.⁴⁶

As indicated in Table 4, the prices of livestock began to fall after 1990. This is because Heifer Project International donated pigs, fowls, rabbits, and goats to disaster victims and villagers. They also introduced new cross-hybridization and modern varieties of livestock. Their activities increased the quantity of livestock produced in some of these villages and consequently led to price reductions. The primary species of cattle raised also changed after the disaster. The *Zebu Gouadali* and *Red Zebu* were popular because before b1986 but became scarce after the disaster.

The Decline in Agriculture

The displacement of people from the fertile areas of Nyos and the demise of the Wum Area Development Authority instigated a regional decline in agriculture Prior to the disaster, agriculture was the main economic activity in Nyos, Chah, and Subum. Agricultural systems like shifting cultivation and rotational bush fallowing were practised to produce laege quantities of crops like maize, beans, soya

beans and groundnuts.⁴⁷ Agriculture was aided by the high-yield fertile volcanic and alluvial soils. The Wum Area Development Authority also facilitated crop cultivation by creating farm-top-market roads, assisting farmers with ploughing, providing quality seeds, and offering loans.

The LND negatively affected all these agricultural activities. Crops were abandoned and large crops of land were left uncontivated. Many farmers died during the disaster and the heavy floods from the lake washed away the fertile topsoil. Additionally, the already harvested crops and entire farmers had to be abandoned. The Kimbi resettlement camp lacked fertile grounds. The soils were not suitable for agriculture, which led the resettled survivors to forcefully and illegally relocate to Ndanghasi, a fertile area along the Kimbi-Wum road. . In response, the government forces destroyed their crops, huts and transported them back go Kimbi.⁴⁸ These actions were supposed the disaster victims safe, but the incident had an enourmous psychological impact.

At the Kimbi resettlement camp, field interviews revealed that the lack of fertile lands in the area negatively impacted on their livelihoods. The soils in this area were not very fertile for agriculture. This was the reason why resettled victims at Kimbi, forcefully and illegally relocated to a fertile area along the Kimbi-Wum road., huts and took them back to Kimbi. Though it was argued that the action was to safeguard the social security of the disaster victims, the psychological impact of this incident on them was enormous. Nyos and Subum also lost their trading advantages because of the gas emission.

Loss of Trading Advantage

Prior to the disaster, Nyos and Subum were trade centres for the Menchum Division of Cameroon. Nyos's strategic location and its cattle market encouraged commerce and the development of local industries like arts and crafts, fishing, agriculture and tourism. The lake was both an attraction and a source in income/subsistence for the peasant population. Available records indicate that, traders places like Douala,

Bamenda, Nigeria and elsewhere to buy cattle and agricultural commodities in Nyos. In the mid-1980s, national and international investors were considering investments in the area. However, the LND slowed the pace of development. Several companies began to withdraw their interests from Nyos, Chah, and Subum.⁴⁹ There were no new crops for traders to buy and the affected areas were declared risk zones that prohibited settlement. The trade advantages shifted to the neighbouring areas of Yemnge and Kimbi.

Loss of Job Opportunities

The LND negatively affected the areas job opportunities. Most resettled persons lost their main sources of income and livelihood activities (e.g., hunting, farming, cattle rearing, petty trading, blacksmithing, arts and crafts. These occupations had offered direct and job opportunities. For example, the weavers created fiber bags, baskets, mats, caps, while the blacksmiths manufactured hoes, knives and spears sold in the Nyos market. The displacement cut them off from these basic sources of income. Additionally, loss of cattle, destruction of the natural vegetation, and the abandonment of farmlands left the indigenes with little or no opportunities to rely on as sources of raw materials and income.⁵⁰ Those who were engaged in buying and selling of animals lost their occupation. Indigenes that produced commodities like pears, beans, cocoa yams other crops lost their livelihoods completely.

The frustrations of the people became glaring at their resettlement site at Buabua where they were restricted from hunting and farming grounds. This brought about occasional skirmishes between the settlers and the indigenous population at their new site. The conflicts were caused primarily by the control and exploitation of natural resources. According to respondents in Buabua and Nyos, the frustration caused the untimely death of several displaced persons. The loss of local occupations was further exacerbated by the fact these victims equally lost access to common property. In an interview with Julius Ngoh, a survivor at the Ipalim resettlement camp, he lamented that

...I had many things in Nyos. I had a farm of about 2 hectares in which I had planted cassava, beans and plantains. After the Lake Nyos Gas emission, we were resettled at Ipalim. Here, land is scarce for cultivation. The Mbororos with their cattle do not allow us to cultivate well on the small plots that were distributed to us by the government. We beg even common cola nut here. Land or house I don't have.⁵¹

This obviously supports the assertion that the Lake had indeed "cursed" them.

Conclusion

The increase in environmental hazards in the 21st century have always had different interpretations and far reaching environmental and socio-economic implications on victims. These implications are very severe in areas without any disaster management framework. A disaster management framework is therefore imperative to maintaining ecological balance and protecting the lives and security of vulnerable persons in affected areas. With the increase in environmental hazards like lake emissions, vulnerable areas are negatively affected due to environmental pollution, forced displacement and resettlement as well as human and material destruction. This puts the socio-economic livelihood of affected persons in jeopardy if proper resettlement is not done. The key issues brought in this paper include among others, the various schools of thought surrounding the causes of the Lake Nyos gas emission and the impact of the disaster on the population and natural environment of Nyos, Chah and Subum. The findings of the paper reveal that, there were several schools of opinion which held opposing views concerning the root causes of the Lake Nyos gas emission. The traditional theorists held that the explosion was a result of the disrespect of the burial instructions of their deceased *Fon* who died in 1983. The scientific school of thought held opposing views on the cause of the explosion. The volcanologists attributed the explosion to volcanic activism beneath the Crater Lake while the limnologists argued that the explosion was a result of the contamination of the lake waters by toxic gases which suddenly exploded in 1986. The conspiracy theorists held that the incident was related to a chemical

weapon that was dropped into the lake and which exploded and killed many people. In spite of the debate by the different schools of thought, the limnological faction was widely accepted and the disaster was considered a natural incident. However, the incident adversely impacted the population and natural environment of Nyos, Chah and Subum. The natural disaster through causal chains affected the people of Nyos, Cha and Subum directly, killing and injuring them, and indirectly: by precluding production, destroying assets and stocks, denying access to services, disrupting the environment and the social fabric and by wasting development opportunities. Volcanologists and limnologist are continuing to measure or study the concentration to toxic materials beneath crater lakes, and researchers are continuing to find ways to combat frequent environmental hazards and developing a disaster management framework. If we cannot develop a proactive disaster management framework, then the socio-economic livelihood of persons affected by environmental hazards will always be put in jeopardy.

More research and innovation is needed on how states can develop a consistent disaster management scheme that involves local authorities in order to limit the negative implications of environmental hazards. Africa's natural hazards are mainly epidemics, endemic diseases, drought, floods, agricultural pests and bush fires, but some areas are also susceptible to earthquakes, cyclones and volcanic eruptions. The natural hazards interact with manmade ones, such as armed conflicts, air, road and railway incidents, other industrial hazards such as mining accidents, chemical spills, etc., and with widespread vulnerability. The context is one of rapid population growth, forced movements of population, environmental degradation, precarious urbanization, food insecurity, poverty, fragile economies, infrastructures and institutions, and cultural and political instability.

Endnotes

¹ Lukamba Muhiya, "Natural Disasters in African Countries: What Can We Learn About them?" *Journal of Transdisciplinary Research in Southern Africa* Vol.6 (2010): 478-495.

² Ibid.

³ Lukamba Muhiya, “Natural Disasters in African Countries: What Can We Learn About them?” *Journal of Transdisciplinary Research in Southern Africa* Vol.6 (2010): 478-495.

⁴ Gerard March, “Natural Disasters and Impact on Health” (University of Western Ontario, 2002)

⁵ United Nations Development Programme (UNDP), “Reducing Disaster Risk: A Challenge for Development, Bureau for Crisis Prevention and Recovery” (United Nations: New York, 2004)

⁶ Forka Leypey Mathew Fomine, Strange Lake Nyos CO₂ Gas Disaster: Impacts and the Displacement and Return of Affected Communities. *The Australasian Journal of Disaster and Trauma Studies*. Vol. 1(0) 2011. P.1

⁷This was the leader of the people of Nyos. It is believed he was also the god of the lake.

⁸The *Kwifon* was a secret society in Nyos. The *Fon* of Nyos at the time was the head of this secret society. Before his death he instructed that his fattest cow be given to this group for sacrifices.

⁹Interview with George Tetang, 58 Years, Farmer, Buabua, 5th May 2019.

¹⁰Sigvaldason Gudmundur, “International Conference on the Lake Nyos Disaster, Yaoundé Cameroon, 16th-20th March 1987: Conclusions and Recommendations” *Journal of Volcanology and Geothermal Research University of Iceland* (1987), p. 97.

¹¹ Shanklin, “Beautiful Deathly Lake Nyos: The Explosion and its Aftermath” *Royal Anthropological Institute of Great Britain and Ireland* Vol.4, (1988), p. 12-14

¹² Volcanology is the study of volcanoes, lava, magma, and related geological, geophysical and geochemical phenomena.

¹³ Sigvaldason, “International Conference on the Lake Nyos Disaster, (1987), p. 97.

¹⁴ Limnology is the integrative, multidisciplinary, scientific study of inland waters. These include; lakes, reservoirs, streams, rivers, wetlands and ground waters.

¹⁵ Eugenia, “Beautiful Deathly Lake Nyos” p. 12-14

¹⁶ Dibussi Tande, “The Lake Nyos Disaster 20 Years After: Revising Israeli Connection” (August, 2006)

¹⁷ Ibid

¹⁸ Tande, “The Lake Nyos Disaster 20 Years After” (2006)

¹⁹Cameroon Tribune, “Lake Nyos Survivors Speak Out” No. 636, (Friday September, 1986), p. 4.

²⁰Sher E., “Environmental Aspects of Air Pollution: Handbook of Air Pollution” (Academic Press, Boston, 1998), p. 27-41

²¹Interview with Tang Sylvester, 63 Years, Bricklayer and Survivor, Nyos, 19th May 2019.

²² Interview with Anthony Jam, Farmer, 68 Years, Subum 12th May 2019

²³ Peter J. Baxter *et al*, “Lake Nyos, Cameroon 1986: The Medical Effects of Large-Scale Emission of Carbon Dioxide” *British Medical Journal*, Volume 298, (1989), p. 140.

²⁴ Sher, E., “Environmental Aspects of Air Pollution: Handbook of Air Pollution” (Academic Press, Boston, 1998), p. 27-41.

²⁵Azibo *et al*, “Natural Disasters, Vulnerability and Livelihood Security in Rural Cameroon” *International Review of Basic and Applied Sciences* (Leibniz Institute of Agricultural Development in Central and Eastern Europe, 2015), p. 13.

- ²⁶ Henry Bang N., “Governance of Disaster Risk Reduction in Cameroon: The Need to Empower Local Government,” *Journal of Disaster Risk Studies African Centre for Disaster Studies* (2013), p. 27.
- ²⁷ Anthony Oliver-Smith, “A Success and Failure in Post Disaster Resettlement,” *Disaster* Vol. 15, (Wiley Online Library, 1991), p. 12-24.
- ²⁸ Fomine, 2011, p.5
- ²⁹ Interview with Mbah Josephine, Farmer, 49 Years, Buabua, 7th May 2019.
- ³⁰ Interview with David Ful, 46 Years, Teacher, Buabua, 5th May 2019. He is also a traditional doctor in Buabua.
- ³¹ Interview with Grace Mbeh, Farmer, 43 Years , Buabua, 9th May 2019
- ³² Interview with Sylvester Yabong, Farmer, 52 Years, Subum, 10th May 2019
- ³³ Interview with George Tetang, Achi Williams and Julius Tamfru, May 2019
- ³⁴ Interview with Hadija Abdu, Farmer, 69 Years, May 2019
- ³⁵ Interview with Mamuda Adamu, Grazer, 52 Years, Ipalim, 22nd May 2019
- ³⁶ Interview with Ibrahim Muhamadu, 54 Years, Grazer, Ipalim, May 2019
- ³⁷ Shanklin, “Beautiful Deadly Lake Nyos,” (1988), p. 4.
- ³⁸ Interview with Mbong Emilia, Farmer, 62 Years, Ipalim, 21st May 2019
- ³⁹ Kum F. George, “Contending Trends and Impact of the Lake Nyos Cataclysm on the Wum area Development Authority (WADA) 1986-1996” *Journal of Humanities Cultural Studies* (University of Yaoundé, Cameroon, 2009), pp. 10.
- ⁴⁰ Ibid
- ⁴¹ Ibid
- ⁴² Kum F. George, “Contending Trends and Impact of the Lake Nyos Cataclysm on the Wum Area Development Authority (WADA) 1986-1996” *Journal of Humanities Cultural Studies* (University of Yaoundé: Cameroon, 2009), p.10.
- ⁴³ Interview with Ali Sali Abdu, Grazier, 74 Years, Subum 13th May 2019
- ⁴⁴ Ibid
- ⁴⁵ Forka, “The Strange Lake Nyos CO₂ Gas Disaster” (2011)
- ⁴⁶ Interview with Sali Gori, 47 Years, Grazer, Ipalim, 21st May 2019
- ⁴⁷ Interview with Marcella Mbong, 54 Years, Farmer, Ipalim, 22nd May 2019
- ⁴⁸ Interview with Odilia Zam, 71 Years, Farmer, Ipalim, 22nd May 2019
- ⁴⁹ Interview with Mary Geah, 60 Years, Farmer, Bafmeng, 23rd May 2019
- ⁵⁰ Interview with Mamuda Adamu, Grazer, 52 Years, Ipalim, 22nd May 2019
- ⁵¹ Interview with Julius Ngoh, 71 Years, Farmer, Ipalim, 22nd May 2019

References

i) Interviews

- Abdu, Hadija. Grazier, 69 Years, May 2019.
- Achi, Williams. 48 Years, Teacher, Bafmeng, 2019.
- Adamu, Mamuda. Grazer, 52 Years, Ipalim, 22nd May 2019.
- Ful, David. 46 Years, Teacher, Buabua, 5th May 2019.
- Geah, Mary. 60 Years, Farmer, Bafmeng, 23rd May 2019.
- Jam, Anthony. Farmer, 68 Years, Subum 12th May 2019.
- Mbah, Josephine. Farmer, 49 Years, Buabua, 7th May 2019.
- Mbeh, Grace. Farmer, 43 Years , Buabua, 9th May 2019.
- Mbong, Emilia. Farmer, 62 Years, Ipalim, 21st May 2019.

Mbong, Marcella. Farmer, 62 Years, Ipalim, 21st May 2019.
 Ngoh, Julius. 71 Years, Farmer, Ipailim, 22nd May 2019.
 Sali, Ali. Grazier. 74 Years (Survivor), Subum, May 2019.
 Sali, Gori. 47 Years, Grazier, Ipalim, May 2019.
 Tamfru, Julius. 50 Years, Nurse (Worker Buabua Resettlement Camp) Buabua, May 2019.
 Tang, Sylvester. 63 Years, Bricklayer and Survivor, Nyos, 19th May 2019.
 Tetang, George. 59 Years, Subum, May 2019.
 Yabong, Sylvester. Farmer, 52 Years, Subum, 10th May 2019.
 Zam, Odilia. 71 Years, Farmer, Ipalim, May 2019.

2) Secondary Sources

Aka, F. T. "Depth of Melt Segregation below the Nyos Maar-diatreme Volcano: Major Trace Element Evidence and their Bearing on the Origin of CO₂ in the Lake Nyos Volcanic Lake" *Springer*, (2015):467-470.

Azibo, Roland. Mbue Innocent and Tifuh Fmunyam. "Natural Disasters, Vulnerability and Livelihood Security in Rural Cameroon" *International Review of Basic and Applied Sciences: Leibniz Institute of Agricultural Development in Central and Eastern Europe*, (2015):108-116.

Bang Henry and Kapila. "Social Risk and Challenges in Post Disaster resettlement: The Case of the Lake Nyos, Cameroon" *Journal of Disaster Risk Studies* (1989):2-8.

Bang, N. Henry. "Governance of Disaster Risk Reduction in Cameroon: The Need to Empower Local government." *Journal of Disaster Risk Studies African Centre for Disaster Studies*. South Africa, 2013.

Clay, J. Edward. *Disaster Risk Management Series*. World Bank, Washington, D.C. (2004):3-15.

Downing, E. Theodore, E. "Avoiding New Poverty: Mining Induced Displacement and Resettlement," *International Institute for Environment and Development*. No. 58, April, 2002.

Forka, L. Mathew. "The Strange Lake Nyos CO₂ gas Disaster: Impacts and the Displacement and Return of Affected Communities" *Australian Journal of Disaster and Trauma Studies*, vol. 1, Yaoundé Cameroon, (2011):1-8

Fualefac, Benard. "Fontem Militants Donate 120,000frs and Food to Survivors", No.664, Friday 5thDecember, 1986.

_____. "Nyos Victims Issued Checks without Cover". *Cameroon Tribune*, No.668. Friday 19th December, 1986.

Ful, Anthony Mbangsi. "Miraculous Survival-Eye Witness Account of the Lake Nyos Disaster," Benakuma, 2003.

Gam, T., Nobert Tohnain and Reeves Meli Fokeng. "Indigenous Agricultural Knowledge and the Sustainance of Local Livelihood Strategies in Buabua and Kimbi- Lake Nyos Gas Disaster Resettlement Camps, NWR of Cameroon" *International Journal of Research and Innovation in Social Science (IJISS)* Vol.2, (2018): 6-8.

Gudmundur, Sigvaldason. "International Conference on the Lake Nyos Disaster, Yaoundé Cameroon, 16th-20th March 1987: Conclusions and Recommendations," *Journal of Volcanology and Geothermal Research University of Iceland*. Iceland, (1987):98- 108.

Gwellem, Sylvester. "Mr Biya Sympathizes with Nyos Peoples", *Cameroon Tribune*. No.668. Friday December 19th, 1986.

Kum, F., George. "Contending Trends and Impact of the Lake Nyos Cataclysm on the Wum Area Development Authority (WADA) 1986-1996". *EAS Journal of Humanities Cultural Studies*. University of Yaoundé, Cameroon, (2009):54-62.

-
- Lang, Michael. "The Presbyterian Church in Cameroon (PCC) and the Management of the Lake Nyos Gas Disaster of 1986" *South-South Enlarge Programme for Research on the History of Development*, Vol.8, 2012.
- March, Gerard. "Natural Disasters and Impact on Health" University of Western Ontario, 2002.
- Mphoweh, N. Jude, Paper Published in Tiger Project/ UNESCO: Monthly Newsletter, November 2008.
- Muhiya, Lukamba. "Natural Disasters in African CAountries: What Can We Learn About them?" *Journal of Transdisciplinary Research in Southern Africa* Vol.6 (2010): 478-495.
- Ngalim, N. Aloysius. "Post-conflict Experiences of Resettled Bakassi Peninsular, 2006- 2016," *Asian Journal of Peace Building. Vol. 7 Institute of Peace and Unification Studies*, Seoul National University, (2019): 105-123.
- Ngwa, Azibo, Mbue Innocent and Tifuh Fomunyam. "Natural Disasters, Vulnerability and Livelihood Security in Rural Cameroon," *International Review of Basic and Applied Sciences*. Vol.3 issue 9 September, (2009):108-116.
- Shanklin, Eugenia. "Beautiful Deathly Lake Nyos: The Explosion and its Aftermath" *Royal Anthropological Institute of Great Britain and Ireland* Vol.4, February, (1988):12-14.
- Tjomp, Clement. "Nation Counts its Dead: Wum Tragedy" *Cameroon Tribune*, No.666. Friday 29th August 1986.
- United Nations Development Programme (UNDP). "Reducing Disaster Risk: A Challenge for Development, Bureau for Crisis Prevention and Recovery" United Nations: New York, 2004.