

Barriers to Natural Disaster Risks Management Within Coastal Communities: The Case of Limbe and Ideneau in Cameroon

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Abstract:- Globally, many coastal zones characterized by high population concentration lie across rigid zones defined by natural disasters such as flood, heat waves, landslide and subsidence which are often difficult to manage. The Limbe and Ideneau Coastal communities of Cameroon overtime have been shrouded by such natural disasters. The aim of the study was to identify the barriers to natural disaster management along the Limbe and Ideneau coastal communities of Cameroon. The study adopted a multi-stage sampling design whereas, areas prone to different hazards were mapped, and through a simple random sampling method, 300 persons were selected from each stratum to provide information on disaster management. Questionnaires, interview guides, interrogations and field investigations were the main primary data sources of the study whereas, secondary data sources such as published related articles, magazines and public libraries provided credential information. Quantitative and qualitative data collected during field survey were analyzed through the inferential and descriptive statistical techniques. The outcomes of the study were presented on graphs, figures, charts, tables and histograms. Findings revealed that natural disasters have caused enormous harms to the population occupying the aforementioned communities such as the disruption of communication infrastructures and housing facilities, touristic activities, farmlands and loss of human lives. Further results showed that many adaptation measures cannot contain the magnitudes and the intensities of these disasters. Limited technology, government negligence, poor planning and insufficient public knowledge on natural disasters are hindrance to the effective management of these natural disasters. The work concludes that these coastal communities remain “bonanza” and recommends that a participatory, holistic and an objective disaster management planning be implemented in order to offset the adverse effects of these disasters while deriving the potentials of the coast.

Keywords: Barriers, Natural Disasters Management, Coast Communities.

I. INTRODUCTION

According to WHO (2022), disaster refers to any occurrence that causes damage, ecological disruption, loss of human life, deterioration of health and health services on a scale, sufficient to warrant an extraordinary response from outside that affected community or area. The American Red Cross (2021) also defined disaster as an occurrence either natural or manmade that causes human suffering and creates human needs were victims cannot alleviate without assistance. The WHO (2022) has further stressed that natural disasters are catastrophic events that are instigated by natural processes of the earth including earthquakes, hurricanes, tornadoes, floods, volcanic eruptions, and tsunamis, among others. However, natural disaster management according to the FOA (2022) refers to the systematic planning, coordination, and implementation of measures to minimize the impact of natural disasters on communities and the environment. It encompasses preparedness, response, recovery, and mitigation efforts.

Disasters and the associated social and economic impacts are on the rise. The last decade has witnessed the highest number of and impacts from disasters, and 2015–2017 were the hottest years ever (EMDAT, 2018 & WMO, 2017). The Asia Pacific region has experienced the highest number of disasters, within which Indonesia is one of the most at-risk countries. Between 1900 and 2017, there were 489 disasters in Indonesia caused by natural hazards; almost 242 000 deaths, 30.7 million people affected and total damage of almost USD 30 billion. Geophysical disasters caused more than 95 % of deaths, while the hydrological, meteorological and climatological disasters occurred more frequently, affected more people, and caused more damages (EMDAT, 2017). The effects of such disasters are expected to increase should in case objective disaster risk reduction measures are not implemented. The 7.4 magnitude earthquake that occurred in the City of Adana in Turkey and touching parts of Syria in the year 2023, killed over 55000 people leaving behind remarkable destruction on the landscape and the extent of property destruction was unassessible. Likewise, devastating flood and landslide events in Italy, Britain, and China have been classical disasters of the present urban century.

The horn of Africa which is characterized by diverse geography, including steep and undulating terrains notably the Ethiopian highlands which encompasses much of Ethiopia, the Somali highlands and parts of Northern Kenya and Djibouti, has high concentration of human population that which has resulted to a high sensitivity and vulnerability to many environmental challenges attributed to floods. The fact is that a majority of the inflated population in these countries live in adverse economic situation that oblige them to inhabit regions and places that are unstable and characterized by flood, landslide, volcanicity, earthquakes and land subsidence (Council on Foreign Relations, 2022). According to the International Office of Migration (IOM) (2023), the torrential rainfall which has end the four (4) year's drought in the horn of Africa has brought untold damages to the population especially the economically deprived population residing in vulnerable areas. For example, the recent flood in the horn and east of Africa resulted to 12 dead in Tanzania, 120 dead and 140,000 displaced people in Kenya

In Cameroon, mountain and steep slope settlements have also been faced with a number of challenges resulting from natural disasters such as flood, landslide and debris flow. This is explained by the fact that most of the steep slopes, valleys and hills have been deprived of vegetation and infrastructural facilities have been perched in many areas characterized by rapid cuttings and fillings by man. However, this renders the areas to be susceptible to many natural disasters. During the 2023 torrential rain at Mbankolo, in Yaounde of Cameroon parts of the unstable environments became saturated with water and was shattered by flood which killed approximately 27 people and damaged 25 houses (CRTV News, 2023). The same phenomenons of natural disasters have been so recurrent in the Limbe Municipality and have been disastrous on humans as well as their properties. This therefore forms the core assessment of this work.

A. The Problem

Over time, the coastal communities of Limbe and Ideneau that harbor a dense of human population and wildlife have consistently been characterized by series of natural disasters that have left landmark destructions on the landscape. The occurrence of these natural disasters is explained by the complexity of the topography characterized by steep slopes which favor mass movements and lowlands that are favorites for sea water intrusion and tidal surges provoking flash flood. The torrential rainfall that often occurs in this zone in the months of June-September causes the modified hilly and steep terrains to get saturated and subjected into collapse. This is further compounded by the high gravitation forces on unstable slopes angles. However, these coastal communities have remained pivotal zones networking the hinterland regions, neighboring countries such as Equatorial Guinea and Gabon; coupled with its worthwhile socio-economic activities that have contributed massively to the GDP of Cameroon's economy. These have been pull factors for the high population concentration in the area that has over time borne the brunt of these natural disasters. In considering the fact that these coastal zones over time have provided perennial and intergenerational

opportunities to the Country and making it gained grounds in the touristic, agricultural, and political as well as successful navigations, nothing concrete has been done by the government to improve their disaster risk reduction measures. Destructive landslides that date back to 2001 around Mile 3 and the man-a-war Bay are resurfacing up till date. Efforts of the municipal council which is an arm of the directorate of civic protection responsible for disaster management have been ineffective and always recording temporal successes. Most of their planning strategies are poor and this is evident by the fact that most occupants of vulnerable areas along this Coast have land titles and building permits issued by some government institutions. This shows the wide gap with the government's efforts in managing these natural disasters. The 1986 Law N°. 86/016 which recognizes the right of civil protection against natural disaster has been swept under the carpet. The occupants of these coastal zones have grappled with adaptation measures to survive amidst these natural disasters and they have all been futile. Most manifesting hazards within these coastal communities have high probabilities of transforming into severe disasters and this further justifies the high vulnerability of the communities to disaster risks. Flood, landslide, tidal inundation and soil erosion occur frequently and their effects are x-rayed on building infrastructures, farming and commercial activities and on human lives, which elaborately expose the negligence of natural disaster management policies and measures by the state and other local government organizations. Coupled with the current haphazard urbanization, communities like Motowo, Mabeta, Mbonjo, down beech and Clerk's quarters, are highly prone to natural disasters. Capitalizing on these unprecedented challenges, this work seeks to understand the curtailing factors toward a successful natural disaster risks management within the aforementioned coastal communities, and proposes sustainable measures that can revamp participatory efforts in controlling these natural disasters and creates sustainable communities.

II. LITERATURE REVIEW AND FRAMEWORK

Global trends, including population growth, poverty reduction, unsustainable urbanization and poor land management, ecosystem degradation and climate change have led to an increase in the frequency, intensity and impact of disaster risks over the last number of decades (EC, 2016). As noted by Forzieri et al., (2017), weather related disaster could potentially affect two-thirds of the European population by the year 2100, causing fifty times the number of fatalities compared to today. According to the European Environmental Agency (2017), the impact of weather and climatic related hazards on the economy, human health and ecosystems are amplified by socio-economic and environmental changes. Efforts to reduce disaster risk and at the same time adapt to a changing climate have become a global and European priority. The two dominant trends that are present in contemporary disaster risk management (DRM) are increasing the resilience of individuals, families and communities in regards to their exposure and vulnerability to hazards, and concurrently strengthening the local, regional and national disaster prevention, preparation and response systems. The first has emphasized the importance of disaster

risk reduction, with the concept of risk as central to disaster management. The latter, seeking to strengthen DRM systems, focuses on establishing various normative frameworks to underpin disaster management; adopting a risk management focus rather than disaster response approach (McDermott & Gibbons, 2015). As indicated in the Sendia framework, Disaster risk reduction activities can greatly improve disaster risk management (UNISDR 2015). DM suffers from inadequate financial support due to the low priority accorded

to risk reduction in Cameroon’s national budget (Bang 2014, 2016).

The study has been built on the APFM (Associated Programme on Flood management) (2007) conceptual framework title *Guidance on flash flood management*. In the perspective of the APFM, Minimizing the risk to life and property is the foremost goal of risk management. To be successful, risk management must involve a wide range of individuals and institutions as presented on Table 1.

Table 1: Flash Flood Management Strategies

Control Administration	River Basin Organization	Provincial administration	Local Administration	Household
<ul style="list-style-type: none"> -Develop national strategies -Create legal framework -Create financial mechanisms 	<ul style="list-style-type: none"> -Long term planning taking into account basin-wide conditions, development , and climate change scenarios -Create hazard/risk maps -Forecasting and dissemination of warnings 	<ul style="list-style-type: none"> -Planning at provincial level -Implementing mitigation measures -Linkage between national and local (basin and catchment) level 	<ul style="list-style-type: none"> -Formation of community based flash flood management organization -Coordination with community based organization -Post flash flood preparedness -Local level early warning system 	<ul style="list-style-type: none"> -Securing household from flood -Organizing life at home -Preparing family for evacuation
Professionals/scientists	National meteorological and hydrological services	Regional organization	Private sector	Crisis management services
<ul style="list-style-type: none"> -Support central administration in planning and strategy building -Prepare guidelines and practical solutions -Advice to government and academia -Capacity building at policy level 	<ul style="list-style-type: none"> -Create early warning and dissemination system -Research 	<ul style="list-style-type: none"> -Knowledge transfer -Capacity building -Trans boundary dialogue -Cooperation facilities 	<ul style="list-style-type: none"> -prepare action plan for damage minimization -Ensure safety of equipment and structures -insurance Implementation of financial mechanism 	<ul style="list-style-type: none"> -Coordinate warning systems -identify vulnerability groups and their needs -Planning response mechanisms -Post flash flood activities
Spatial planners	Academia	NGOs	Media	
<ul style="list-style-type: none"> -Create spatial planning -Land zoning -Support regulation 	<ul style="list-style-type: none"> -Flood education -Research support -Advice to government 	<ul style="list-style-type: none"> -awareness raising -Capacity building Pressurize higher level -Post event support 	<ul style="list-style-type: none"> -Awareness raising -Exert pressure -Early warning -Post event support and information dissemination 	

Source: Adapted from APFM (2007)

As presented on Table 1, proper disaster management can be rest assured if the strategies and the stakeholders indicated are involve in decision making. The framework encompasses all the four phrases of integrated disaster management. Indeed it will be a participatory disaster management approach as local households are engage in the process. The framework stressed on the roles of the local government bodies as well as community mobilizers which is what is actually lacking in disaster management in Cameroon. The framework blends a combination of measures to address disaster management taking into account preparedness measures such as the creation of early warning systems, insurance and creation of spatial planning and mitigation measures such as flood education, research support, and prepare action plan for damage minimization and ensuring

safety of equipment and structures. In the response phrase, search and rescues, identification of vulnerable groups and their needs, and organizing life at home and preparing families for evacuation. The final stage which is the response phase, there is an advice to the government, support to the vulnerable population, assessment and evaluation, clean up and restoration as well as emergency aid and relief

III. RESEARCH APPROACH

A. Location of the Study Area

The coastal communities of Limbe and Ideneau are found in the coastal lowland of Cameroon which lies within the Gulf of Guinea between Latitudes 3°57'30" to 4°14'0" north of the equator and Longitude 8°50'0" to 9°17'30" East of the Greenwich Meridian. It occurs along the rocky coast of Cameroon and covers a surface area of about 674 km² (Limbe Town Planning Office, 2000). This stretch of coastline moving from Batoke, Bakingili, Debundscha, Njonji, Isobi-Ideneau, falls under Fako Division of the South West Region of Cameroon. It is the link between the ocean and the continental segment of the Cameroon Volcanic Line (CVL) and is found where the Cameroon Mountain extends into the Gulf of Guinea. It experiences the sub-equatorial climate (hot

and humid throughout with two distinct seasons), four months of dry season from November to March and eight months of rainy season that runs from mid-march to November with a mean annual rainfall of about 3600mm (Che *et al.*, 2012, & Melle *et al.*, 2019). Annual rainfall along the coast is thus high with yearly precipitation varying from 1500mm to 5000mm in the last 34years for different stations (C.D.C Meteorological center, 2014). Peak rainfall is recorded from June to August and at times in September. June and July are characterized by intense and short lived rainfall usually lasting less than five hours a day, whereas, August and September tend to experience less intense but more prolonged rainfall that can last for four to five days in a row. Figure 1 shows the location of these Coastal communities in Cameroon.

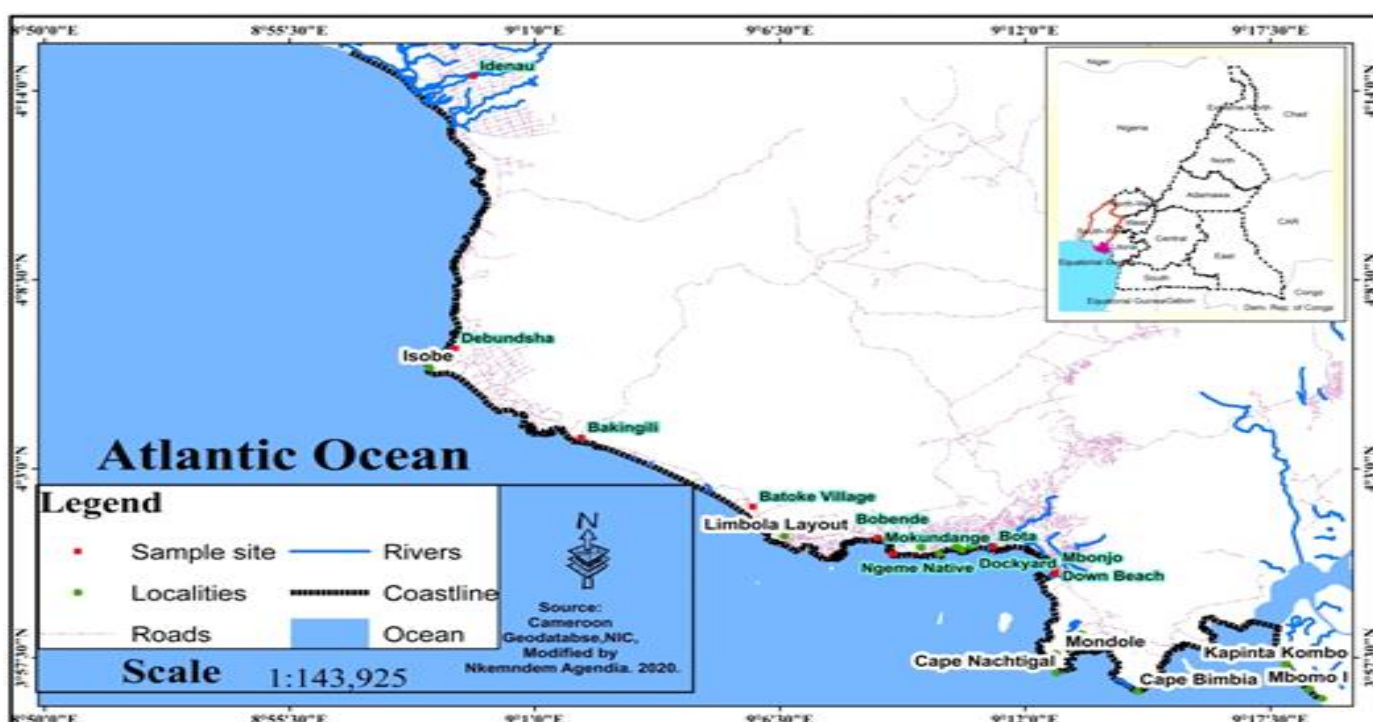


Fig 1: Location of Ideneau and Limbe Coastal Communities in Cameroon

Source: Cho Cosmos (2021)

B. Research Methodology

The study was investigatory and explanatory in nature, overarched by a mixed research design involving the qualitative and the quantitative techniques. The investigatory method facilitated findings on the frequency, types and the dimension of natural hazards occurring within the coastal communities as well as the affected number of individuals and properties, while the explanatory method helped in determining the destructive capacity and established reasons why disaster risk reduction strategies are ineffective along this geographic zone. Furthermore, the qualitative and the quantitative techniques helped the researcher to provide answers to the qualitative and quantitative aspects of the study, respectively. The use of the two techniques helped the researcher to tape the advantages enshrined in them and to also reduce their inherent biases.

The study targeted households living along the coastal zone and those highly vulnerable to natural disasters. Furthermore, the municipal council offices, community rescue groups, ministry of forestry and wildlife, NGOs and ministry of town planning were targeted as key informants. The study adopted a multi-stage sampling technique whereas, areas with different categories of natural disasters were delineated and approximately, 300 questionnaires were administered to the targeted household population within their entirety. Also, 30 structured interview guides were designed and conducted with the aforementioned institutions to sought out some needful and insight information for the study. Added to these primary data sources were direct field survey, interrogation and testimonies from victims. As for the secondary data, magazines, Newspapers, public libraries and published related articles on natural disasters were consulted. GPS, GIS and digital camera were tools used to geo-tag and

mapped out areas affected by natural disasters. Furthermore, pens, pencils and jotters were used in noting down testimonies made by victims and stakeholders who exposed information concerning natural disasters. Motor bikes facilitated movements from one part of the study area to the other.

The obtained quantitative and qualitative data from field survey were added themes and coded and inputted on Excel version 16 and exported to SPSS Version 17 w(h)ere normality test was done using the Kolmogorov. They were later analyzed using the inferential and descriptive statistical techniques to derive their frequencies, percentiles, relationships and projections. Further information which could not be analyzed was used as recommendation measures. During the field survey phase, photographs were

taken in areas affected by natural disasters to expose the reality of their types, extent and the individual adaptation measures. The analyzed information was visualized on graphs, charts, pie-charts, tables and histograms. Ethic-wise, measures against Covid-19 and cholera pandemic were strictly implemented. Also, respondent’s identities and information were kept confidential.

IV. RESULT

A. Dominant Natural Disasters Occurrence within Limbe and Ideneau Coastal Communities

During the course of the study, investigations were done on the common natural disaster occurring within the coastal communities of Cameroon and the information presented on Figure 2 was obtained:

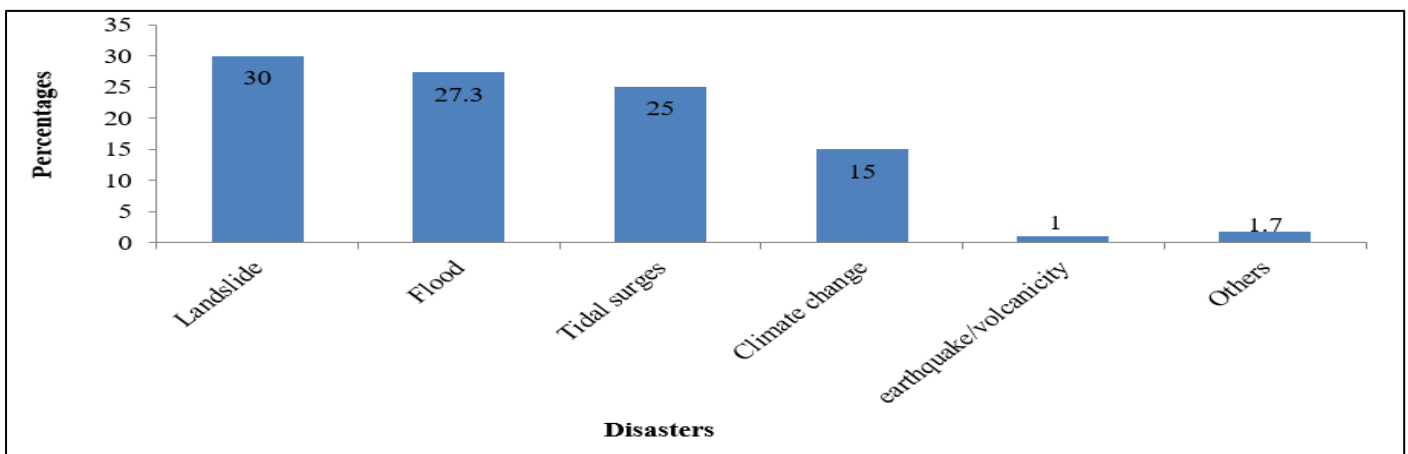


Fig 2: Dominant Natural Disasters Occurring within the Coastal Communities of Cameroon
Source: Fieldwork (2023)

As presented on Figure 2, 30% of the respondent complained that the most common natural disaster that they have been grappling with over the years is landslide, 27.3% pointed at flood disaster, while 25% and 15% of the respondents said that tidal surges and climate change are the dominant natural disaster, respectively. Furthermore, 1.7%

of the respondent point at storms and cyclones and the least (1%) said that there is the occurrence of earthquake and volcanic eruption. This finding was buttressed with Figure (3) showing the spatial distribution of natural hazards within the Limbe and Ideneau coastal communities.

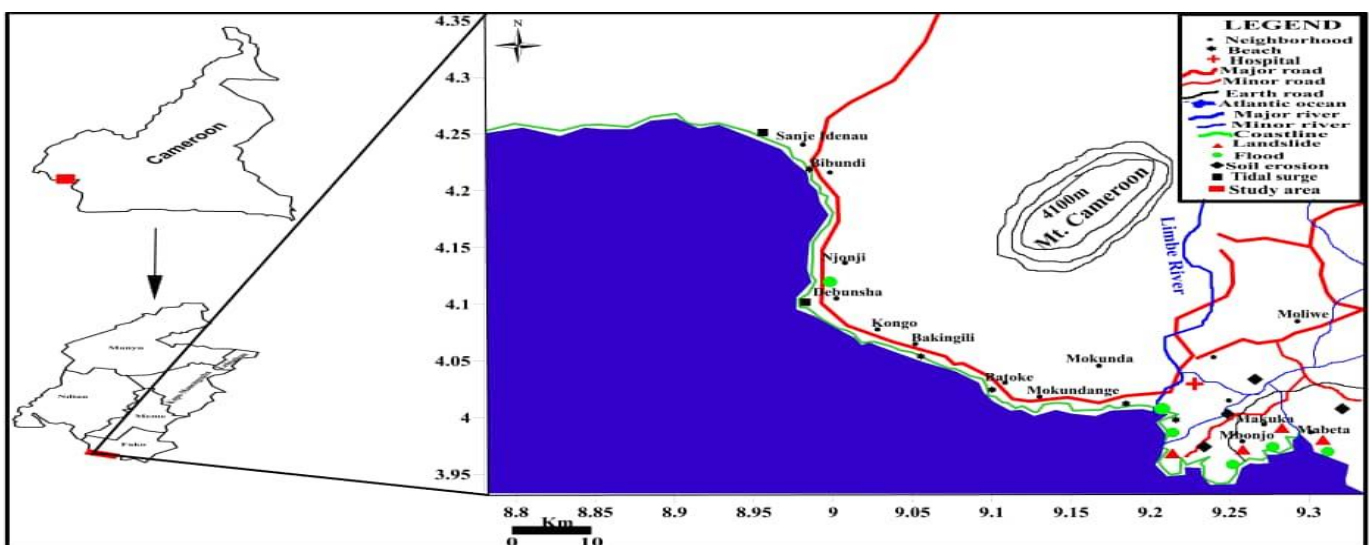


Fig 3: Spatial Distribution of Natural Disasters in Coastal Communities of Limbe and Ideneau of Cameroon
Source: Realized by Mimche (2024)

- Landslide:** As presented on Figure 3, there are multitudes of landslide occurring along these coastal communities especially around Mabeta, Mbonjo and Motowo. This is predominant in these areas because of the steep and rough nature of the environment. On such vulnerable landscape, humans with their wide goose chase of resources have utilized them by hewing the existing forest and vegetation, stone and ground mining to raise housing facilities which are being perched on modified areas. Also, on these steep slopes, there have been frequent cuttings and fillings of the landscape to shape them into structures that suit building designs. Subsistence and clandestine farming activities are also practiced across these steep slope which render the slopes void of vegetation and expose them to multitudes of denudation forces such as wind, gravity and water. During the dry season, with the increasing environmental temperatures enhanced by anthropogenic activities and El Niño events, most of the grounds become less cohesive and are subjected into soil creep and rock fall, which affect human activities and infrastructures. In the rainy season, the increasing rainfall causes the interfered steep slopes to become saturated with water, such that they become less resilience and are liable to landslide. Associated with this

landslide, we have, landslips, and mudflow in many communities

- Flood:** Floods are also the commonest and most destructive hazard within Limbe and Ideneau coastal communities. They often occur in the rainy season especially in the months of August-October when the coast is always characterized by intensive rainfall. This always leads to flood as runoffs from proximal communities converge at some points within the town. When this happens, in regards to the fact that most drainage systems have limited sizes and capacities, there is always a slow rate at which runoff is being conveyed to the suburbs and this usually results into water inundation and consequently flood into the nearby surroundings. Flood is also animated by the poor town planning within these communities. Most of the houses with other urban infrastructures have developed in areas interfering with the drainage systems. As such most of them have become blocked such that during heavy downpour, running water finds it difficult to move out of the town thereby diverting into people’s homes and farmlands.



Plate 1: Shows Some of the Manifestation of Natural Disasters within the Limbe and Ideneau Coastal Communities
Source: Fieldwork (2024)

- Tidal Surge:** The tidal surges enhance by strong winds over the ocean also push large portion of water to move toward the coastline and in areas where the coastline is weak and cannot resist the force of the waves, water splashes against the coastline and spread across the urban environmental thereby leading to flood events. Such strong phenomenon has been common in the year 2015 up till date due to the rapid urbanization. The reserving trends

of the El Nino and La Nina events are the driving factors behind this flood. The fast degradation of the coastline has been so because of the increasing magnitude of tidal energy. The coastline has retreats at a faster rate especially in the rain season which is characterized by high tides and this affect farming activities, farming, transportation, tourism and commercial activities being done within Limbe and Ideneau coastal communities of Cameroon.

- Climate change:** Coastal areas were known to be areas with congenial environmental conditions due to the moderating effects of land and sea breeze. Today, the reverse in the state of environmental conditions across coastal environments remain an unimaginable condition situation. Temperatures within these communities have suddenly changed from what they used to be and coastal dwellers are crying of record breaking temperatures on daily basis. This is as a result of increasing anthropogenic activities whereas, trees which are sequestrations of carbon have been cut down by man while mangroves which are considered as the lungs of the landscape have also been utilized and transformed into cultural landscape thus, leaving the environment necked. Typhoons have also been occurring along this coast provoking storm surges that usually result into flashflood. Most of the commercial and domestic activities done around the coast are often disrupted at times for weeks due to floods. The increasing trends in the frequency and magnitudes of El Niño events have has compounded the vulnerability of coastal dwellers to flood.

living environments. This polluted water usually carries waste water from open waste dump sites and around damage pit-toilets into people’s homes. And because of these, portable water sources as well as inhabiting homes become risky for the population. Furthermore, during natural disaster, lucrative farming activities located around the coastline are often damage as boulders, scoria materials and sediments are spread over the farms. When this happens, crops are usually damage while farmers located on hill or steep slopes do suffer from excessive soil erosion.

Also, children’s educations with other socio-economic activities are usually dwarfed amidst disaster events. Flood which is instigated by torrential rainfall usually last for days and as such school premises, hospital and commercial centers are usually inaccessible, and because of that, most people especially students and traders are usually deprived of carrying out most of their activities. in addition, because of complex natural disasters, which are beyond man’s controlling ability in the area which is compounded by his socio-economic vulnerability, a lot of losses is usually incur and in trying to recover from such shocks, the local community dwellers spent collateral sums of money which affects they standards of living.

B. Socio-Economic Implications of Natural Disasters

During the course of the field survey, investigations were done on the socio-economic implications of natural disasters within Limbe and Ideneau coastal communities of Cameroon. The commonest amongst the effects were as presented on Figure 4.

Furthermore, separation of families (10%), disruption of touristic, injuries and loss of lives (8.3%) are also some of the negative effects of natural hazards in these communities. They are endowed with diverse touristic potentials which have been sources of huge income to the municipal council and the country at large. The area is also a spectrum of biodiversity. The occurrence of natural hazard especially around forest environment destroyed some of this wildlife. The beautiful beach scenery is always blighted with mud and pollutant such as plastic bags and papers. Furthermore, accessibility to some of these precious resources at times becomes too difficult as rainfall usually block roadways. The overarching effect of natural disaster in these communities that has been bitter pills to swallow is the dead and injuries incur by human. Since 2001 when these natural disaster became manifesting, there have been a lot of death and injuries of humans especially on hill slopes like Mabeta and Sokolo which are characterize by extreme landslide as well as flood. There have been instances where houses on steep slopes collapse and killed people, whereas, little children who are vulnerable or left careless during torrential rains are swept away in this area.

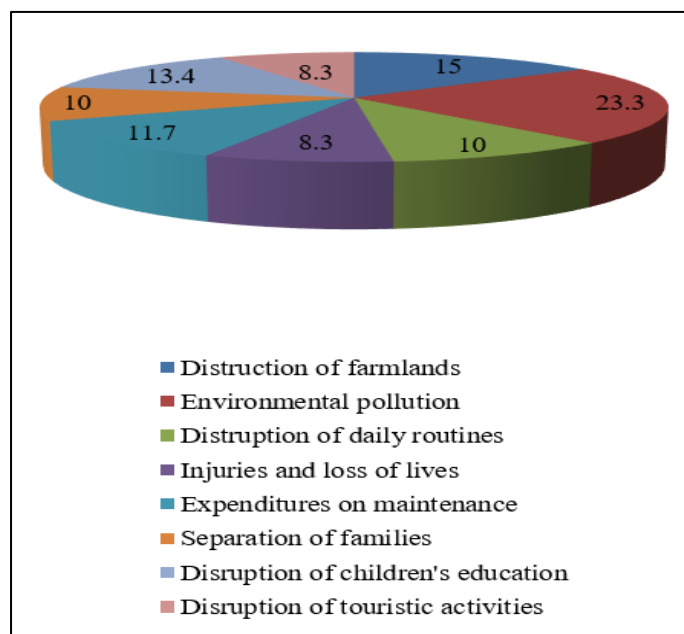


Fig 4: Socio-Economic Implications of Natural Disasters
Source: fieldwork (2024)

As presented on Figure 4, the most destructed effect of natural hazards as supported by 23.3% of the population is environmental pollution and this happens mostly during the occurrence of storm surges, tidal inundation and flood that often resulted to the spread of polluted and salted water into

C. Land Use Activities within Limbe and Ideneau Coastal Communities from 2000-2020

In order to show how vulnerable humans and properties are to natural hazards in the coastal community of Limbe, its land use maps of 2000-2020 have been presented. They demonstrate the concentration of human population and their activities along the coast, as well as, the degradation of forest endowments and the coastline itself. Figure 5 shows the detail.

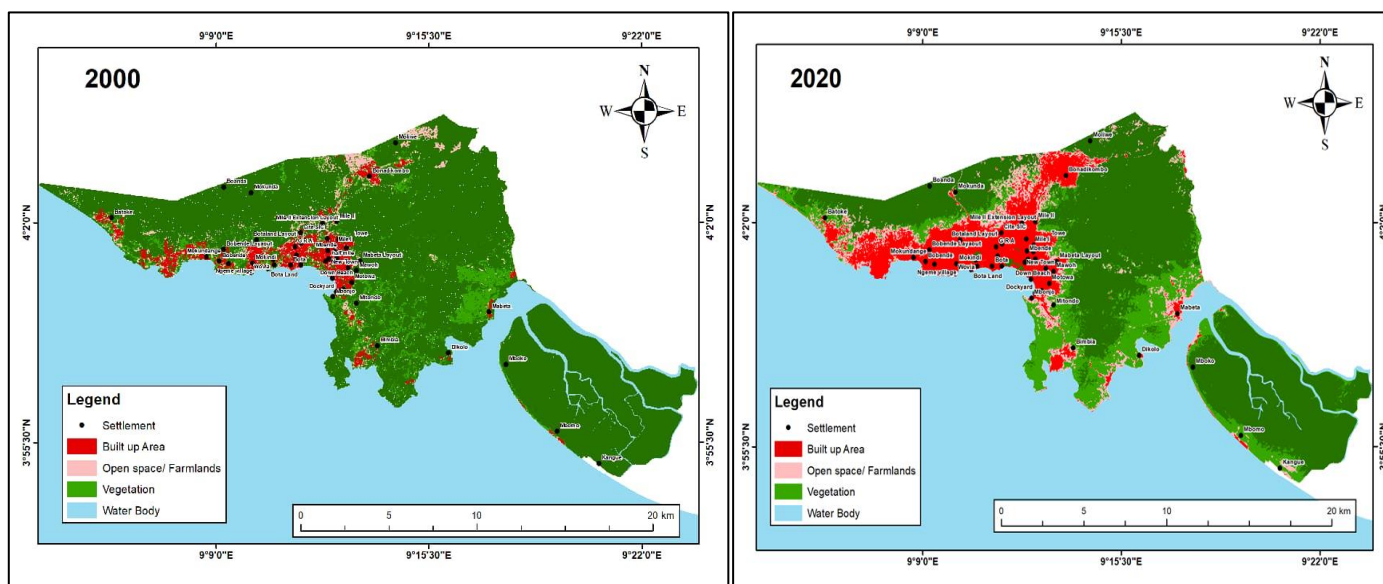


Fig 5: Land use Maps of the Coastal Community of Limbe Showing 2000-2021
Realized by Mimche (2022)

➤ The information presented on Figure 5 has been presented statistically on Table 2.

Table 2: Changes in Land Cover of Limbe from 2000 to 2021

Land cover category	Surface area Occupied in km ² (596) and the Percentages(100%)				Degree of Change in km ² and Percentages	
	2000		2021			
	Km ²	%	Km ²	%	Km ²	%
Infrastructure	30.63	5.14	97.98	16.44	67.35	11.3
vegetation	492.06	82.56	424.35	71.2	-67.71	-11.36
Farmlands	29.14	4.89	41.90	7.03	12.76	2.14
plantations	44.16	7.41	31.77	5.33	-12.39	-2.08

Source: Established from Figure 5 (2022).

As regards to Table 2, it shows the rapid growth in built up areas against other land covers from 2000 to 2021 in Limbe. With a total surface area of about 596km², infrastructure area covered 30.63km² (5.14%) in the year 2000. With an increasing population infrastructure has now expanded to more than 11.5% of the total surface area of limbe subdivision. This rapid increase in infrastructure has threatened the environmental sustainability as evident by the expansion of roads and buildings into marginal lands like floodplains and steep slopes that are liable to landslides, floods, coastal erosion and sea level rise.

D. Barriers to Natural Disaster Risks Management in Limbe and Ideneau

The management of natural disaster risks in Limbe and Ideneau has been characterized by many challenges and so thus, the risk has been increasing over time and affecting communities and the proximal populations. These factors are explain below:

➤ **Poor Planning**

One of the factors responsible for increasing disaster risks in the coastal communities of Limbe and Ideneau is poor planning. Settlements and homes are not well plan. Most of the settlements have been raised on steep and unstable slopes, construction of houses entails cutting down of forest and

bulldozing of the ground surfaces. With such activities, many areas become vulnerable and are easily affected by natural disasters such as landslides and slope collapse. The municipal council and the ministry in charge of housing and development are not efficient in land use planning as there are fewer experts to do so. And thus, people end up facing the effects of disasters which could have been avoided. We have many houses located in disaster prone environments and the owners of these houses have land and building permits granted by the local council. This shows how relax environmental planning is in these municipalities.

➤ **Rapid Population Growth**

Rapid population growth is another factor that has contributed massively to the occurrence of natural disasters within these communities. Overtime, the population has grown astronomically and such growth entails the occupation of space for settlement and other socio-economic activities. With the socio-economic vulnerability of a majority of these populations, some of them are force to leave around risky environments such as hill slopes, affected coastal areas and artificial environments which are difficult for the disaster management authorities to manage.

Map 1 shows the trend of population growth in the Limbe Municipality.

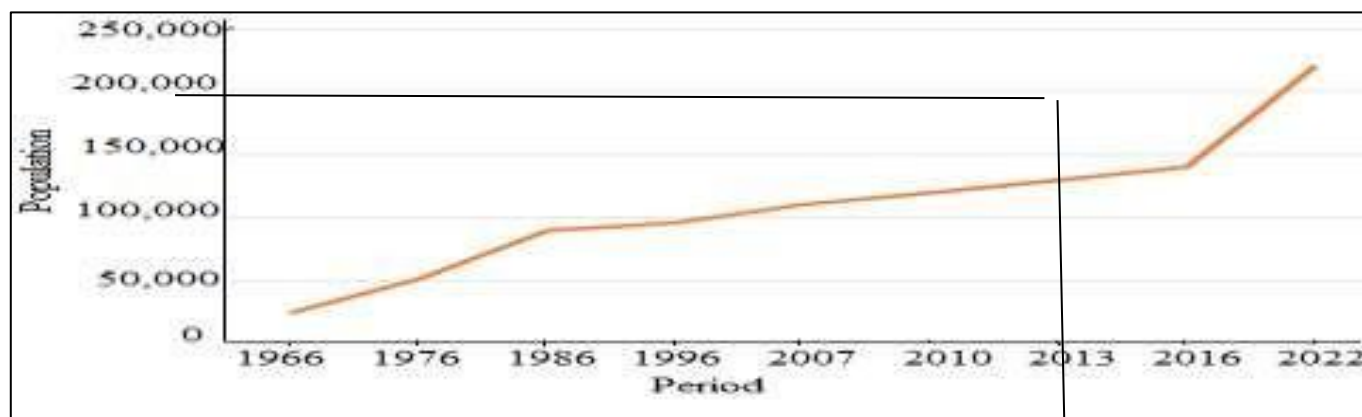


Fig 6: Population Evolution of Limbe between from 1966 -2022

Source: Limbe Council (2022)

The Limbe City Council (LCC) (2010) estimated the population of Limbe at 120,000 inhabitants, spread over a surface area of 671Km² (with population density of about 179 persons per Km²). In 2013, the population was estimated at 130,000 inhabitants giving a population density of 194 persons/Km². According to population projections by Fombe and Molombe (2015) Limbe should have a population of around 200.000 inhabitants. This population is spatially distributed across the three municipalities that make up Limbe with the greater Share found in Limbe I, followed by the Limbe II and Limbe III. The phenomenon of population growth applies same in the Ideneau municipality that is currently experiencing a rapid population growth. This leap-frogging growth shows a large proportion of the population who are usually affected by natural disaster in Limbe when they occur. The scale of destruction might increase with the current environmental degradation in the area.

➤ *Negligence*

One of the proven barriers to the effective management of natural disasters in the aforementioned Scoastal communities is negligence. Most natural disasters have been neglected by most households. To them, the occurrence of these natural disasters is a cultural inheritance. A majority of the households/population know when the next natural disaster will occur, for example, coastal flood and they consider it as a seasonal or yearly something. Because of this conception, most of them do not bother to implement barriers that can weaken the destructive capacity of the disasters. The government and local councils on the other hand are the same; they only try to protect areas which are of their interest. They neglect the population inhabiting the marginal environments and more to that, their approaches to natural disaster management within areas of interest are mostly the reactive approach which are not really effective.

➤ *Intensity of the Natural Disasters*

What is actually responsible for the poor management of natural disasters in these areas is the magnitude and the recurrence of the various natural disasters. Like the case of flood, it occurs every season and very severe and destructive. Because of this, many individuals who try to adapt to it by construction of embankments and other forms of natural barriers end up being discouraged, coupled with their

economic vulnerability. More so, there are unstable environments hosting individuals who supposed to quit and settle elsewhere due to the increasing magnitudes of the natural disasters, but because of poverty and limited knowledge on natural disaster risks, they have remained within such environments and thereby becoming more vulnerable. With the rapid changing environmental conditions animated by increasing anthropogenic activities, multitudes of natural disasters are happening with severity across these coastal environments.

➤ *Limited Technology*

Limited technology is one of the overarching factors that has dwarfed and contributed more to the poor management of natural disasters within these coastal communities. Firstly, the government and the municipal councils which form the arms of natural disaster management body in Cameroon have limited technological innovations at their disposal. In areas of massive landslide like the slopes around Mile 2 and flood around the Seme beach, there are no early warning systems that can alert the population on the occurrence of natural disasters. More so, emergency infrastructures that can help transport or carter for people during the occurrence of natural disasters such as paved roads, and health care centers are lacking. These further add to the vulnerability of the affected population as they have limited means of recovering. More so, the communities are not well organized; there are no locally created groups that can help people during the response phase of a natural disaster.

V. DISCUSSION

The coastal communities of Limbe and Ideneau with their inflated population concentration and credible livelihoods opportunities have been hotspot of natural disaster owing to the fact that they lie at the foot of the Mount Cameroon with rough and complex topography that favors the occurrence of natural disasters. Increasing rainfall on steep slopes is the driving mechanisms of rock fall, erosion and deposition, as well as flood and land slide in the area. With their sea sites locations, increasing wave's activities enhanced by changing trends in most El Niño and la Niña events have been gateways for flood occurrence, ground

subsidence, river banks collapse as well as changing climatic conditions. These findings corresponds to that of Yinkfu *et al.*,(2023) who in examining the various challenges of adapting to physical constraint on the eastern slope of Mount Cameroon, noted that the main driving mechanisms were increasing rainfall and the rough nature of the physical environment itself.

Findings have revealed that the dominant natural disaster within these communities is flood and landslide as well as the rapid climate variations. Floods occurrence are increasing with much destruction in these communities because of the rampant anthropogenic activities that have neutralized the various natural and man-made drainage systems that facilitate the conveying of water to the outskirts of the town. The increased intensity and magnitude of sea level rise has a direct influence on the occurrence of this flood whereas, the colonization of steep and unsafe slopes like the cases of Bonjo and Mabeta has rendered the environments vulnerable to landslide and other forms of mass movement and thus, increasing the sensitivity level of the resident population to natural hazards. The moderating effects of sea breeze on temperatures within the approximate communities has been weakened by the increasing anthropogenic activities characterized by subsistence agriculture, settlements and other urban land use activities. this finding is also true with that of Nkemasong *et al.*, (2023) who noted that the expansion of human population along the coastal communities of Fako and Kumba was the main agent of land mutation that enhances the occurrence of flashflood

The various land use maps of the year 2000 and 2020 give proves of the fast exploitation and the rapid mutation of these coastal communities. Infrastructural facilities have superseded the previous vegetation and forest that existed in the area leaving behind artificial land surfaces which are easily affected by natural hazards. The population trend has also leap frogged entailing the fast utilization of space along these coastal communities for construction and agricultural activities. Because of the occurrence of multitudes of natural disasters, the populations are first with life threatening phenomenon such as flooding around inhabiting environments, the destruction of farmlands by torrential rainfall, interruption of communication lines, social activities such as education and health as well as commercial activities. The reasons for the poor management of these natural disasters are as a result of rapid population growth, poor planning, intensity of the natural disasters and negligence by most community dwellers.

The above findings concise with that of Adzadeh *et al.*, (2020) who in do an application of geospatial techniques and logistic regression model for urban growth in limbe, noted that the population has been growing rapidly over the years. However, due to such growth, many parts of the town are suffering from environmental degradation and the challenges of poor planning, limited technology and negligence, which have left many of the population to suffer from natural hazards such as flood, landslide and seas water intrusion.

VI. CONCLUSION

The Limbe and the Ideneau coastal communities have been serene grounds of worthwhile socio-economic and agricultural activities. Like-wise, they have been safe and comfortable grounds for human habitation. Their sea sites locations give the Cameroon authorities massive opportunities to trade with foreigners and to exchange enormous water resources thereby earning them enough income. However, overtime, these coastal communities have been face with multitudes of natural disasters which have predisposed some of the opportunities and the attractive forces which they portray. For instance, recurrent flood and landslide events have done untold damages to many families and tourist thereby threatening the fate that they attributed to the area. Social institutions such as schools and hospital have been disrupted as a result of the occurrence of natural disasters. On the contrary, these coastal communities will always be attractive grounds of population immigration and sites for staple economic activities their natural and human endowments. As regards to these, it will therefore be of essence and in the interest of the communities to implement sustainable measures which can weaken the destructive capacities of these natural disasters and to help provide safe grounds that can foster human habitation and successful socio-economic deliveries. If such measures are not well implemented and coordinated; the futures of the current and next generation in these communities will be dwarfed.

RECOMMENDATIONS

- In order to enhance an effective disaster risk reduction policies along these coastal communities and make it more suitable for human habitation and maintain the natural scenery of the area, the following should be done by the following organizations/persons
- The government should embrace sustainable frameworks such as the Sendai framework through its disaster management institution and various organs/arms, and domesticates the disaster risk reduction strategies enshrined in the framework to the local and national levels, so that disaster risk reduction can follow a systemic path to enhance resilience
- The institution in charge of disaster risk management should not be centralized. It should be decentralize to all the regions by creating local bodies that represent and transmit information to top officials
- The government should also invest in disaster risk management policies such as the development of early warning and monitoring signals in risk zones
- The government should enhance disaster preparedness by improving in robot infrastructures in the area such as public houses, transport infrastructures and well protected portable water sources
- Education and research should be promoted in the area so as promote an effective mastery of the environment.
- The council could implement non-structural methods such as legislation and laws around risky zones and should also come out with land use classification to make sure that vulnerable zones are avoided

- Effective evacuation mechanisms such as improved accessibility, community rescuers and alternative portable water sources could also be provided by the council
- Local infrastructural development and housing construction by the local population should be well monitored by the council and land titles and permits should not be grant to those located in vulnerable zones
- NGOs should encourage environmental conservation practices such as the planting of forest in vulnerable areas, building of embankments in affected areas and should always support victims affected natural disasters
- Local population should avoid settling in risky zones and should not practice

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