

# Assessing Environmental Causes and Impacts of Erosion in Agulu-Nanka Community

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**Abstract:** The paper is aimed to encourage environmental and sustainability consideration into strategies decision making process, such as the formation of policies plan and programmes in curbing the incident of gully erosion. Erosion, a surface sculpture of the earth landscape, an accelerating phenomenon which resulting from movement of soil by water, depositing such detaching soil elsewhere which constitutes global environmental problem, gulping houses, hectares of land and aquatic life. Erosion constitutes major ecological problem in south eastern region of Nigeria and requires adequate scientific and proper technical competence, a progressive albatross, which some geologists attributing to the unsavory development to civil war activities, such as indiscriminately digging of trenches by soldiers as well as detonation of explosives and bombs in the region where war actively raged. Strategic environmental assessment, a tool in preventing, protecting and preserving the environment from gully erosion ogre which constitutes major ecological problem to Agulu-Nanka communities. Application of strategies environmental assessment, a scientific technology enhancing the control of gully erosion menace. Moreover, to access and determine the cause and effects of erosion in the study area for a sustainable development programme.

**Keywords:** Erosion, prevention, protection, strategy, environment, soil, deforestation

## Introduction

Gully erosion is defined as relatively deep vertical-walled channel recently formed within a valley where no well-defined channel previously existed, Akpokodje et al (2010). The active erosion occurs where the erosion is actively moving up in the landscape by head cut mitigation Obidimma and Olurunfemi on their resolving the Gully erosion problem carefully defined gully erosion as a process whereby the surface layer of the soil is attached and carried by agents of denudation, a cover in the soil, is exposed leaving a topographic roughness on the resulting landscapes. Gully erosion occurs when soil is eaten away by natural agencies and is simply removal of soil, including plant nutrients from the land surface by various agents of denudation, Ofomata (2000). Erosion could be smoothing or leveling process with soil or rock particles being carried, rolled or washing down by force of gravity, therefore it is one of the surface sculpture of the earth's landscape and constitutes one of the global environmental problem.

Onyeagocha (1986) with good understanding described erosion as an accelerated phenomenon which resulted from movement of soil by water, wind or other agents and deposition of such detached soil elsewhere. On the other hand Onwuka (2008) observed erosion as included soil forming as well as soil eroding process which maintain soil in favourable balance/deterioration and loss of soil as a result of man's activities. Egboka (1993) asserted that Anambrastate is the most erosion devastated state in Nigeria and adjudged as the most erosion pruned and erosion devastated landscape in the world.

Anambra state has some dose of the environmental ogre which has intimidating sizes of erosion sites, and obviously threatened by a physical environment that seems over ready to slip into nothingness, Nwajide and Reijers (1986).

Erosion ogre is a progressive albatross in the southeast, which some geologist attributed to the unsavory development to war activities, such as indiscriminately digging of trenches by soldiers as well as detonation of explosive and bombs in the South east in Biafan war, where war actively raged; Igbokwe et al (2008).

Erosion has caused horrendous and incalculable havoc in the Southeast of Nigeria, although various efforts made by the communities affected, to checkmate the menace amounted to nought in the face of the rampaging landslide. Some effort made by the state government to contain this menace through practical measures and enlightenment campaigns on the indigenous population on erosion ravaged localities yielded nothing, Obiekezie et al (2000). Therefore erosion is one of the surface sculpture of the earth's landscape and constitutes one of the global environmental problem. More so, gully erosion is the most impressive and striking ogre and most serious mechanism of land degradation in the southeastern part of Nigeria and one of the major global environmental problem the country is seriously facing.

Gully erosion within settlement requires of peculiar attention because of the threat it poses to building and other structure that endanger human lives. The gully erosion in Agulu-Nanka has posed numerous threats to the inhabitants of the area and has caused many residential building and worship centre to collapse, destroying roads net works, and other infrastructure and degrading land for commercial and agricultural purpose Igbozurike (1989).

Ezechi and Okagbue (1989) stated the Agulu-Nanka communities are of the opinion that the gully erosion caused impairment of relationship, when people left their homes and became refugees in the neighbouring towns, which could lead to poor health condition and increase in crime rate. A total of 787 houses and 325 hectares of farmland belonging to the 567 affects households were gulped by the landslide as a result of gully erosion in the area as observed by Igbokwe et al (2008).

Agulu-Nanka erosion complex has posed a big challenged to foresting, companies, local population and the state in a general, regarding deforestation of this. The problem has defied all efforts to control it as the erosion is spreading like wildfire to other neighborhood, like Umuchima-Ekwulobia, Oko and others. The landslide has become more potent and active, gulping everything in its course. People are retreating, abandoning homes livestock, economic trees, and farm lands. The devastating conditions have led to untold socio-economic problems.

Apart from destruction of houses, farmlands and economic tress, the erosion has caused siltation of rivers, streams and consequent loss of biodiversity and water supplies for domestic purpose, Albert et al (2000).

There is also the destruction of aquatic life in the affected Odor river in Nanka and Agululake. The gullies are nuisance interrupting communication as well as despoiling farmlands. More,so, there is the impoverishment of soil over wider areas resulting from deforestation and its replacement by open tussocky grassland. It also led to the problem of finding alternative plots for those whose houses and farm lands had disappeared in the landslide and those whose lands were put out of cultivation as result of conservation regulation passed by the local authority. If compensation and resettlement are to be made to the displace the source of such compensation presents a problem.

There is the problem of population swollen of the neighbourhood town and villages because those land have been gulped by the erosion, some trooping to other areas in search of new homes and means of sustaining life. The erosion has further hindered infrastructural development of the area.

Erosion and flood, especially in both urban and rural areas have fast becoming the most reoccurring disaster in many communities in Anambra State. Many communities infrastructure and farmland have been destroyed by these hazards.

Gully erosion is a single major process responsible for the lost of vast amount of soil in state as seen in the study of Akpokodje et al (2010).

Nnodu (2005) observed that one kilometer of gully would produce 10,000 cubic metres settlement per km<sup>2</sup> of land. He further emphasized that such happens for a gully aged 100years the mean annual rate erosion would be 1.5tonnes per hectare per year.

Obidimma and Oluruntemi were of view that Anambra State is besieged by serious environmental degradation, resulting in gully erosion due to very high intensive rainfall resulting in heavy runoff and soil loss. The problem have adversely affected agricultural productivity and thus casting doubt of food scarcity in the zone. The ecological and social settings in the zone are often distorted sometimes leading to losses in human and material capital. Most often high torrential rainfall of the South eastern states of Nigeria creates enabling environment for catastrophic soil erosion in the region Ndubude (1982). Surely erosion is the greatest threat to environmental setting of Southeastern Nigeria, is gradually and constantly dissecting the landscape of Agulu-Nanka area.

**Aim and Objectives**

The aim is to access and determine the causes and effects of erosion in the study area a sustainable development.

The Objectives are to:

- Determine the surface run-off occurrences whenever there is excess water on the stop that cannot be absorbed unto the soil.
- Ascertain infiltration due to soil compaction and increase in run-off.
- Determine effect of run-off from agricultural level that is greatest during raining seasons.
- Create awareness of exposure of erodible soil that has poor structure and lower organic matter.
- Encourage the protection of soil from raindrop impact by covering the soil with vegetation.
- Avoid the consideration of small fields into large ones which often result in large slop lengths of scouring.
- Avoid the effects of tillage operations that could cause potential soil erosion.

**Study Area**

Agulu-Nanka lies between 7° and 7°.30E and 6° and 5.30°North of equator. The erosion complex itself lies about 95 kilometers Southwest of Enugu and about 52 kilometers East of the Niger River. Although the site lies within the moist rainfall belt of Southern Nigeria, the vegetation is predominantly derived savanna dominated by a continuous occurrence of oil palm tress (Okafor, 1986). The rainy season is between April and October. The soil of Agulu-Nanka consist of acid sand, laterite and alluvial. The people of Agulu-Nanka area are occupationally farmers, business men and traders. The agricultural crops cultivated include cassava, yam, maize, banana, plantain and vegetables. See fig 1



## Causes of Gully Erosion

Gully erosion generally is caused by several factors working simultaneously or individually to detach, transport and deposit soil particles in a different place other than where they were formed Nwajide and Hague (1979). Moreover, gully erosion can be caused in a number of ways having different mechanism modes and condition of formation, some of which are directly related to the underlying geology on the surface geology and soil cover, Ezechi and Okagbue (1989) summarized the type of gully erosion with respect to their modes and conditions of formation, and common advance mechanism. The resultant effects of these phenomenon are deep cuttings and ravine which dissected the entire Agulu-Nanka area. It is well establish fact that a number of environmental factors as well as pedagogical parameter influence the extent of soil, erosion wherever it occurred globally (Eze, 2000). The study indicated that the nature of the underlying bed has a bearing on the initiation and propagation of gullies. Observations have also shown that gully erosion, in Agulu-Nanka is more predominant in the sedimentary terrains and perhaps in the basement/sediment contact areas like Agulu-Nanka.

This account for why its occurrence is more skewed Agulu-Orumba local government areas of Anambra State. The factors that cause erosion in Anambra state are guided by human factors known as anthropogenic factors. Actually man has helped in reshaping and preserving the earth surface yet man has also helped in causing instability of equilibrium in the natural ecology and hence the rapid spread of environmental problem such as soil erosion.

Anthropogenic factors are technical factors comprising mainly of land use and tillage methods, the choice and distribution of culture and the nature of agro-technology. Vegetation clearance intensive harvesting and over grazing leaving the soil bare are among the factors that encourage soil erosion. Soil compaction caused by heavy duty machinery which reduces the infiltration capacity of the soil and thus promoting excessive water runoff and soil erosion rainfall and soil factors as being the main agents that determined the extent of soil erosion hazard. The soil factors represented the soil erodibility which is also a product of geology and soil characteristic.

### Anthropogenic Influence comprise:

- Mis-use of land
- Poor farming systems contributed to the collapse of soil structure and encourage accelerated runoff and soil loss due to erosion.
- Uncontrollable grazing caused by the nomads has resulted in deforestation of the land
- Indiscriminate foot paths created on the landscape has helped in incipient channels on the landscape to form the channels eventually metamorphose to gullies especially when they are not checked at inception.
- Road construction including uncontrolled infrastructural developments have contributed significantly in gully development. Some road networks under construction have been abandoned in the areas due to gully formation.
- Improper channeling of runoff water.
- Dumping of refuse on the water ways
- Poor construction evident by absence of anticipated runoff in the designed of roads
- Roads were constructed without drainages to channel the runoff into the nearby stream or river.
- Haphazard erection of building on steep terrains and water ways.

In Anambra state most of the gullies took the advantage of the loosely consolidated and friable rocks such as the Ajalli sandstones. The cause of gully erosion with respect to the geology settings as suggested by the earlier studies were numerous, Ofomata (2000). Moreover, some of the identified natural causes include:

- Tectonism and uplift
- Geotechnical properties of soil and others

Some of the geological, hydrogeological, geotechnical and hydrogeo chemical characteristics of the area and human activity have contributed to the gully development and growth. Major aquifers and aquitards from multiaquifer systems and heavy rainfall caused the rise in the water table. The increase in hydraulic head produced rapid flow rates that enhanced the gully process. Expansion and contraction of clayey soil and shales in the rainy and dry seasons respectively led to slumping and landslides.

## **Impact Assessment of Agulu-Nanka Erosion**

Agulu-Nanka gully erosion in contemporary is put as the greatest scourge ravaging the two communities. This gully erosion and landslides have terminal and cancerous ecological disease that destroyed within minutes or at most hours land formed over thousands of years. According to Egboka (2007). The problem resulted from gully erosion in Nanka-Agulu were so many and were varied too. They included human, material, political, psychological, sociological, economical and spiritual all rolled in one for a sustainable development.

### ***Physiological Impact Assessment***

Physiological effect of erosion activities is most immediate reaction to environmental stress. Some community member were induced to hypertension and high blood pressure even leading to loss life. Some were fully of anxiety, anguish and stress, despair, anger and life full of despondency.

The effect of erosion menace in the lives of people led to loss of lives some either fell into the gullies and sustained various degree of injury or died. Some people were reported drowned in some of the gully sites. In the past few years some adults and children have been reported lost their lives in a single event of gulling activities in both Nanka and Agulu towns in Orumba and Aguata local government areas. Also thousand of people have been displaced and evacuated their homes following the gully incidence. The fully erosion in Agulu-Nanka and Oko communities in Anambra State has created deep-gullies and wide craters, threatening to sweep away the homes of about 1825 families as the channels are continuously expanding at an alarming rate. This has caused the people, living with palpable fear and psychological trauma whenever the rainy season commences thus justified that the activities affects the people mentally. This erosion oge brought problem of over population swollen of the neighbourhood towns and villages because their land have been gulped by erosion and they trooped to other areas in search of new homes and greener pasture for sustainability of life.

### ***Socio-cultural impact assessment***

This impact caused the isolation of villages and towns. Gully erosion in these communities resulted in the separation of adjacent villages and towns which involved the collapse of box culverts linking them together, therefore the lives of the populace were severely affected as there were scarcity of amenities. This had negative impacts on these communities since the facilities such as schools, hospitals, water supplies and road networks shared by the affected neighboring communities have become inaccessible. Transportation of farm produce were also affective and this also led to loss of agricultural products especially the perishable ones. Traders who used to go to these communities for their trade were also cut-off from their normal day to day business. Moreover, their dead bodies or corpse are being carried to far away place for burial and even erosion has unearth their sleeping heroes or ancestors from resting places (graves). Also, destruction of social infrastructure caused impairment of relationship among families, churches and school.

Obviously erosion affected the social standard of the communities, resulting in the increase of social vices that impacted adversely on some socio-cultural values of the people. Among these are youth restiveness, due to non availability of employment, which would have been availably from farming, local industries and small business. These also increased the level of poverty in these communities. Some so, some important cultural ceremonies were denied or disrupted from the people because of families were displaced and settled elsewhere.

### **Environmental Impact Assessment**

Erosion activities led to the destruction of aquatic life in Odor river in Nanka and Agululake, despoiling farmland. It over burdened farmland resulting from deforestation and its replacement by open tussocky grass land. The aftermath of erosion activities in these communities brought destruction of agricultural land, loss of ancestral homes and properties, devastation of social network Agulu-Nanka erosion activities is threat to vegetation, it has resulted in loss of vegetation and wild animal species, as it continuous expansion encroached into these communities that were hitherto forest, leading to falling of trees and exposure of more surface areas to gully activities. The erosion phenomenon if continues and remains unchecked might ultimately lead to climate changes locally.

The environmental impact affected most properties in this areas. Several properties whose value could not be quantified accurately were destroyed and others were under threat by the menace especially houses and other properties located on the flood plain about 13 houses were lost in a single event of gully erosion at Agulu-Nanka areas in Anambra State alone as a result of erosion activities on separate note. Federal government discovered 21 gully site in Agulu-NankaEkwulobia, Oko, Awka, Nnewi and others all in Anambra State.

Apart of untimely evacuation from these such as pipelines, utility cables roads and houses also suffer from these hazardous events.

### **Economic Impact Assessment**

Erosion displaced hundred of families and rendered them homeless, and some loss their livestock and farmland. Money was lost due to economic set back of these deserted (unsettled) families. The few people who were staying could not make any significant increase in their income.

Surely the movement of people away from their communities led to lost of business, farmland, loss of farm produce, loss of increase, loss of properties, increase in price of goods and service, unemployment and incidence of impoverishment loss of local industries, Consequently, loss of vast area of farmland due to erosion menace has led to drastic decrease in agricultural productivity and ultimately food shortage that could led to famine. This gully erosion in these communities has given rise to infertile and barren farmland that needed to be reclaimed. This usually brought untold hardship to the inhabitants, if he land is still inhabitable but has been several affected. According to Anambra State ministry of environment, the state has lost over 30 percent of her land, over 40 percent of the total area of land and homes are being threatened by the ugly incidence.

### **Health Impact Assessment**

Increase in soil erosion, an increase in deforestation and a reduction of oxygen supply by the tress as well as lower amount of carbon dioxide being removed from atmosphere could lead to ill-health.

Erosion deposits from farmland to the Odor river in Nanka and Agululake have a lot of nitrate and phosphate due to application fertilizer on the crops. This singular act creates soil salinity down to the river and lake. The deposits also created eutrophication in Agululake due to nitrate and phosphate. This eutrophication created room for mosquito breed and causing malaria disease.

This deposits sometime in 1997 was directly linked to the incidence of river blindness in Nanka. The blackfly and mosquitos transmitted river blinding and malaria into the people through bite. Also tapeworm from cattle, a parasitic disease invaded Odor River in Nanka due to erosion sediments deposited in the river. The disease infected the people with rainfall urination and abdominal pains. The impact on health led to lost of many hours that would have invested in labour as a result of being infected by these diseases, even could lead to loss of lives.

### **Legal Impact Assessment**

Anambra State has enacted a low against individuals or company channeling rainstorm from their compounds to the roads. That every individual or company must have a big sealed ditch or sump to reduce cause of erosion through reduction of flood velocity, which could gradually destroy the roads. The implementation of this law has helped in the reduction of erosion menace in the state. Agulu and Nanka indigenous have benefited from the law as the stakeholders (communities) are empowered to participate in the regulating and monitoring.

### **Conclusion**

Gully erosion constituted the major ecological problem in Anambra State and requires adequate scientific and proper technical competence in the prevention and control of this menace. An effective control of gully erosion is possible unless and until the principles and mechanism underlying its behavior and distribution overtime, and space are fully understood, according by in his Eze (2000.) in his strategies for enhancing adoption soil conservation technology. However, incorrect information, incomplete data or wrong concepts in the application of method of erosion control have aggravated gully erosion problem.

Anambra State has suffered heavily from the havocs of gully erosion and its causes included natural and anthropogenic source. The impacts included loss of human and animals lives, loss of properties and land resource. Some of the solutions to erosion menace proffered by the experts for sustainability included, improved farming technique, cultural methods of gully control, the enactment of laws against any activities that favour gully growth. However, poor or lack f implementation have hindered the complete evaluation of proposed solution. Some poor quality of work led to greater erosion, as in the case of road construction probably due to poor supervision, poor funding and corruption.

## Recommendation

Anambra State, local government authority and stake holders in environmental management should sensitize for a sustainable development. The people on the cause, impacts and problem of erosion menace. The prevention of the processes and mechanisms that resulted into or advance the gully erosion should be of paramount important to all the stakeholder in environmental management in the state organic carbon, chemical properties textural characteristics of moisture context of the soil which is the most useful factor in control of erosion must be considered in the detailed survey (Osadebe and Enuvie, 2008), in the bid to better design preventive measure.

The preventive measure, used to curb the ugly menace of gully erosion are as follows:

- avoid poor farming technique, avoiding farm technique which is a contributing factor to the growth of gully erosion.
- avoid refuse dumping along the river course, which impede the flow of water loading especially during heavy rain fall.
- maintain a good cultural method or vegetation technique of erosion in control.
- planting of cash-crops such as plantain banana and some grasses species such as *Gulaliopsisbinata* on the flood plan have been found to be effective and suitable especially for slope stability and erosion control.
- adequate awareness and enlightenment are of effect of human activities on both flood plan and river channels to avoid misuse of the area.
- effort should be made by the state government to enact a law against locating of engineering structure on water ways.
- Anambra state should take gully erosion menace as matter of urgency to yield to addressing issues relating to erosion especially gully erosion at an early stage so as to avoid loss of people lives and properties.

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