

SOCIOECONOMIC IMPACT OF GULLY EROSION IN KUJE AND GWAGWALADA AREA COUNCILS, FCT ABUJA, NIGERIA

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ABSTRACT

The study was carried out with the view to assess the consequences of gully erosion on the means of livelihood of the people living in Kuje and Gwagwalada area councils, and the available control and coping measures. Relevant data chiefly from field measurements and structured questionnaire administered to respondents within the 5km radius of the 20 selected gully sites were used for the analysis. The gullies as identified were characterised by average age of 8 years including the average depth, width and length of 3.14m, 6.27m and 155.55m respectively, while the inhabitants of the study area are predominantly farmers represented by 30% of the study population compared to other socioeconomic activities. The major consequence as indicated by the 30.5% of the total respondents was poverty, as a result of loss or reduction of income by the incidence of gully erosions in their communities. The total land intake by the 20 gullies in the study area is estimated to be 21341.2m², while the soil loss is calculated to be 93131.25m³. All the respondents however agreed that there are negative impacts of gully erosion on their means of livelihood, but may be 'light' or 'moderate' or 'severe' rate of impacts as indicated in the scale of 1-10. Also, the two basic gully control measures employed in the study area are the mechanical and biological techniques, which were not very effective. Meanwhile, the spearman rank correlation coefficient adopted statistically for this study showed that there is a large degree of relationship between the impacts of gully erosion and the socioeconomic activities in the study area. The study therefore recommended that the farmers and the real estate developers should ensure the use of erosion brakes on their farms and sites respectively, and the government should invest more on the issue of gully erosion carrying all the stakeholders along, considering system approach.

Key words: Gully, Erosion, Soil, Social, Economic, Impact, Environment.

INTRODUCTION

Man is a part of the natural environment, but the anthropogenic activities over the period of time especially in craving for food, developmental and industrial strides have been responsible for the significant shift in the balance of the natural ecosystem which invariably has led to the environmental degradation. Environmental issues are majorly the problems being encountered in the biophysical environment, which refers to a state in which the order and law of the ecosystem are collapsed as the ecological function it originally had is destroyed due to the anthropocene (Funk, Tyson, Kennedy and Johnson, 2020). The major environmental issues include climate change, global warming, erosions, floods, deforestation, depletion of resources, destruction of ecosystems, extinction of wildlife, pollution, overpopulation, soil degradation, waste disposal, forest fires, earthquakes, landslides, droughts, volcanic eruptions, polar ice caps, ocean acidification, and many more (Sadhu, Garg and Kumar, 2018).

According to Abdulfatai, Okunlola, Akande, Momoh, & Ibrahim, (2014) in their own submission regarding soil erosion affirmed that soil erosion is one of the surface processes that sculpture the earth's landscape and constitutes one of the global environmental problems. Although gully erosion problems arise mainly from natural causes, but their extents and severity are increasingly being attributed to man's negative environmental impacts due to ignorance and unintentional action as explained by Eseigbe, and Gbakeji (2014). Over cultivation and compaction also cause the soil to lose its structure and cohesion and it erodes more easily (Osayande, Edobor, and Kato, 2019). According to the United Nations Environment Programme UNEP (2012), 24 billion tones of fertile soil and 15 billion trees are being lost annually to land degradation. Globally, between 2015 and 2019, at least 100 million hectares of arable lands are lost annually, (UNCCD, 2023).

Like in other parts of the world, gully erosion is one of the major environmental challenges facing Nigeria. The available literatures on the subject show that this menace is more predominant in the South-Eastern part of Nigeria (Abdulfatai, *et al*, 2014). Consequently, the Federal Government of Nigeria in 2012 with the assistance of the World Bank instituted the Nigeria Erosion and Watershed Management Project (NEWMAP) aimed at addressing gully erosion in the Southern Nigeria and land degradation in the Northern Nigeria (NEWMAP, 2012).

Loss of land, collapse of access roads and buildings, loss of farms and crops, water pollution, displacement of persons and farmlands among others, are common to Gwagwalada Area Councils of Abuja thereby making economic activities and livelihood more difficult (Oluyori and Ojo, 2021). The Federal Capital Territory (FCT), Abuja, Nigeria, experiences an annual growth rate of 9.28% as against the National economic growth rate of 4.8% consequent on the land use change (Ejaro, 2009). For land to remain a viable resource indefinitely, it is expedient to ensure adequate protection against gully erosion (Xiaobing, Hao, Shengmin, Richard and

Xing, 2019). In all the Area Councils in FCT, Kuje and Gwagwalada area councils are worse hit of over 100 active erosion sites at various stages of development across the over 200 communities (Agagu, 2009). Some of these sites cover up to 500 meters and range from 4-10 meters in width to 10-25 feet in depth (Dalil and Nsini, 2014). The pertinent questions therefore are what are the perceptions of the populace on the issues of gully erosion and its implications on their socioeconomic activities? How much land intake has the gully erosion in the study area, and what are the respondents' adaptation and mitigation measures on the socioeconomic consequences of gully erosion?

THE STUDY AREA

Kuje: Kuje study area lies between latitude 8°52'56" to 8°56'32" North and longitude 6°58'13" to 7°33'11" East of Greenwich Meridian. The Area Council is located at the center of a very fertile agricultural area with abundant clay deposits. It is bounded by Gwagwalada Area Council to the North-West, eastward by Municipal Area Council, and Abaji Area Council to the South-West (Uluocha, 2012). The Area Council has the highest landmass in the Federal Capital Territory with 1,644km² (Kuje Area Council, 2010). See Figure i.

Gwagwalada: The Gwagwalada study area lies in the downstream of River Usuma and located between latitude 8° 55' and 9° 00'N and longitude 7° 00' and 7° 05'E. The area covers a total of 1069.589km² (Oluyori, 2021). It is bounded by Abaji area council by the West, Eastward by Municipal area council and South by the Kwali area council (Figure i).

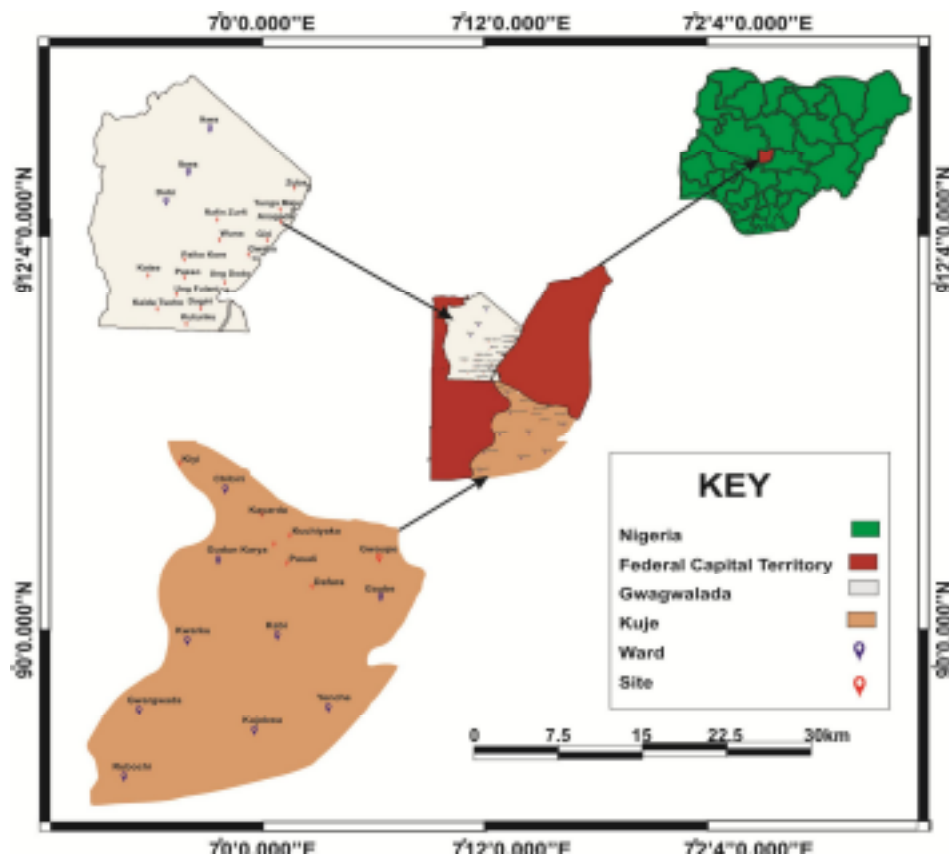


Figure i. Map showing the study area.

Landform in Kuje Area Council consists of two major types; the hills and the plains (Hassan, 2008). However, the plains are engulfed by the hilly and dissected terrains. The major plains are Iku-Gurara and Robochi plains (Balogun, 2001; cited by Kanee, Adeyemi, Edokpa, and Ede, 2020). According to Hassan, Ishaya and Haruna, (2008), Gwagwalada which is situated on the Iku plains is at the lowest elevation above the sea level in Abuja environs.

METHODOLOGY

MATERIALS AND METHOD: Gullies identification and assessment were undertaken in a reconnaissance survey. Data on gully dimensions were obtained from direct field measurements, while field observations and the administration of well-structured questionnaires formed the sources of data.

The random sampling techniques were employed to select the 10 wards out of the 20 wards in the study area using Fisher and Yate two-digit table of random numbers. Also, random sampling technique was adopted in the selection of 20 communities from the 126 communities in the 10 selected wards. Purposive sampling was therefore adopted in selecting the 20 gully erosion base on the length, depth and width. These gully erosion sites selected are located at Gwako, Kiyi, Rafin Zurfi, Wuna, Kuntuku,

Ung Fulani, Kayarda, Ung Dodo, Paiko Kore, Kaida Tsoho, Tunga Maje, Anagada, Pasali, Giri, Dagiri, Kuchiyako, Gwaupe, Dafara, Zuba and Katse communities (Figure ii). The sample size of 400 was determined using the Taro Yamane formula, while the 400 copies of the questionnaire were randomly administered to 20 respondents at each selected gully site within 5km radius, and targeted within the age bracket of 18 to 65 to ensure active and appropriate representation. The data obtained were summarized after descriptive statistical analysis, and presented in the form of tables, charts and percentages.

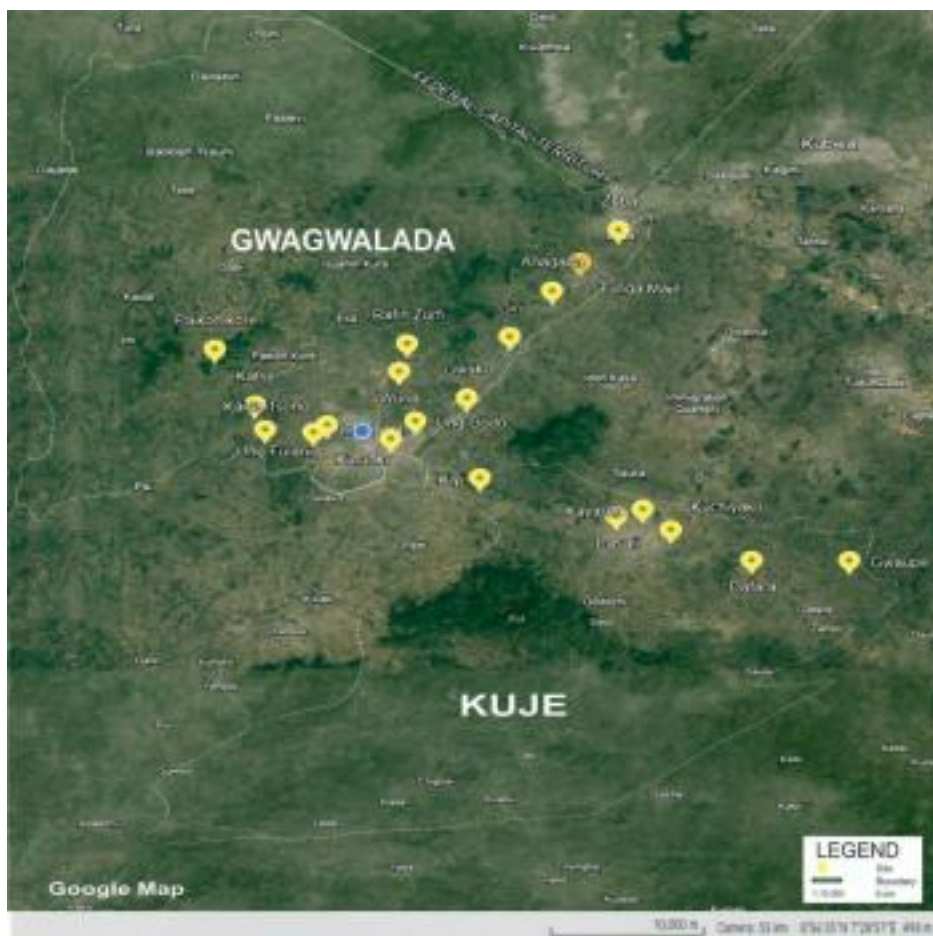


Figure ii. Google Earth Image showing locations of major gullies selected in Kuje and Gwagwalada area councils.

Source: Field Survey, 2023.

RESULTS AND DISCUSSION

Characteristics of the Gully Sites

As observed in Table 1, the largest gully in terms of average length, width and depth is the gully site at Kaida Tsoho with 247m, 20.6m and 6.2m respectively. The gully with the smallest measurement was the one at Kayarda which has the average length, width and depth of 85m, 1.1m and 0.8m respectively. Also, Laterite mining activities aided

the gully erosion at Pasali site where the perimeter fence of the school of the gifted is at the verge of collapsing (Plate iii). The Kutunku community is separated from the Kaida Tsoho community as the major road connecting them is engulfed with a very deep gully (Plate iv). The livelihood of the inhabitants of these communities has been hampered with, thereby brought hardships.

Table 1: Attributes of the Gullies.

S/N	Gully Sites	Coordinates (32N)		Length (m)	Mean	Mean
		Northing	Easting		Width	Depth
1	Gwako	991160.48	294730.52	148	1.7	1.4
2	Giri	995040.11	296623.19	236	4.9	3.6
3	Rafin Zurfi	995914.42	288182.65	119	5.4	3.5
4	Wuna	994555.59	290116.09	134	8.3	3.9
5	Kutunku	987873.04	285724.65	212	3.1	2.2
6	Ung Fulani	987459.61	285095.72	152	2.4	1.5
7	Dagiri	988181.34	290233.24	121	5.9	4.3
8	Ung Dodo	989688.03	292040.16	129	2.0	1.6
9	Paiko Kore	994591.17	283787.67	180	3.2	2.8
10	Kaida Tsoho	988817.02	283812.33	247	20.6	6.2
11	Tunga Maje	1002162.50	302737.70	194	5.8	3.7
12	Anagada	999210.87	300385.81	124	4.5	2.3
13	Pasali	982909.21	303126.74	162	6.4	3.9
14	Kiyi	985132.48	296257.87	137	4.2	2.6
15	Kayarda	982092.15	304636.99	85	1.1	0.8
16	Kuchiyako	981669.67	307057.38	128	18.8	5.4
17	Gwaupe	980943.68	310283.24	116	5.7	4.2
18	Dafara	980392.78	311084.51	210	15.6	4.5
19	Zuba	1003663.92	303465.33	137	3.4	2.8
20	Katse	990990.43	280177.05	140	2.3	1.6

Source: Field Survey, 2023.



Plate iii: Laterite Mining Endangering the School of the Gifted at Pasali.

Source: Author 2022.



Plate iv: Gully Erosion Site at Kaida Tsoho.

Source: Author 2023.

The gully sites at Kuchiyako and Dafara are other areas of concerns (Plates v and vi respectively). They have the depths of average 4.95, which are situated at delicate locations in the communities. These pose serious threats to life around the communities. The economic loss of resources as a result of these gullies, and the cost of remediation which would have been channeled towards other developmental purposes, including extinction of social heritage, formed the negative socioeconomic impacts of gully erosion in the communities of Kuje and Gwagwalada area councils.



Plate v: Gully Erosion Site at Kuchiyako Ext. III, Kuje.

Source: Author 2023.



Plate vi: Gully Erosion Site at Dafara.

Source: Author 2023.

5.3 Analysis of the Major Social and Economic Activities in the Study Area. The social and economic engagements of the respondents are presented in Figure iii. The highest socioeconomic engagement is the Arable farming with 99 respondents which represent 24.75% of the study population, while other farming practice include livestock farming which covers about 5.25% of the study population. About 12% of the respondents are civil servants cutting across the Federal, FCT and Local governments. While fishing and hunting, manufacturing company, and technology got 1% representation each, Islam priesthood and traditional priesthood also got 0.25% representation each, including 0.5% representation of Christianity priesthood.

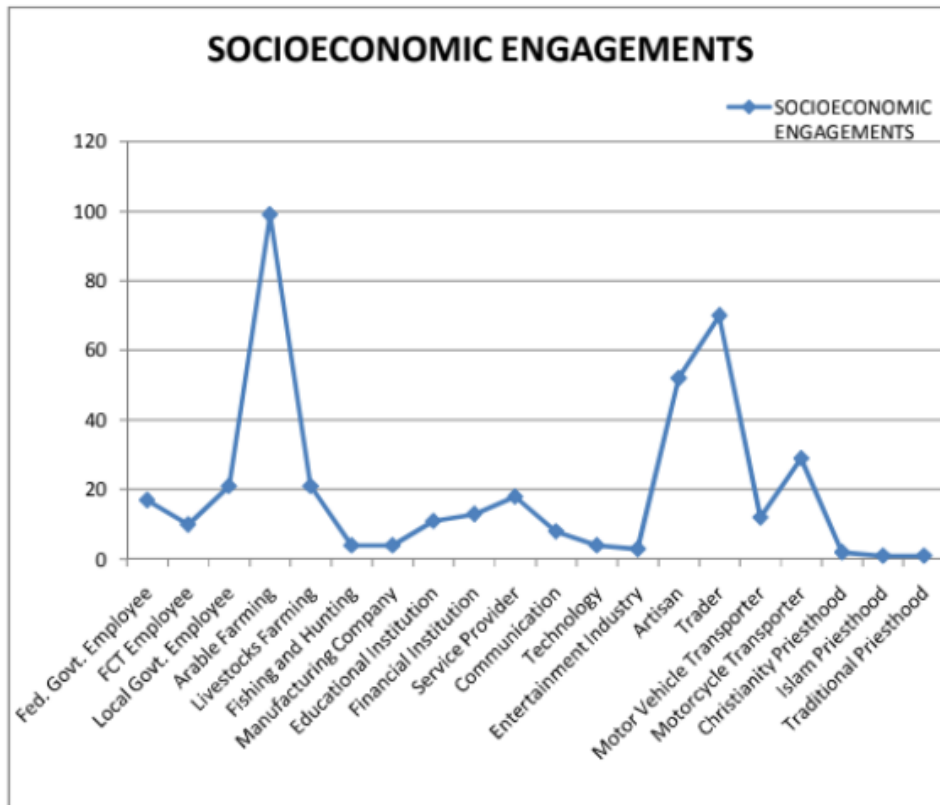


Figure iii: The Major Social and Economic Activities in Kuje and Gwagwalada Area Councils.

From the findings, the study therefore identified arable farming, trades and artisanship as the major socioeconomic activities in the study area, while other engagements include commercial motorcycle transportation locally called “Okada”, livestock farming, service provider, local government employee and commercial vehicle transportation.

5.4 Implications of Gully Erosion on the Socioeconomic Activities in the Study Area. This section provides the detailed analysis of the respondents’ views on the incidents of gully erosion in the study area. The perceived causative factors of gully erosion, the probable consequences or effects of the gully erosion on the socioeconomic engagements of the respondents are here analysed as perceived by the respondents in the study area.

5.4.1 Respondents’ Perceived knowledge on Gully Erosion.

The respondents’ views on the causes of gully erosion (Table 2) showed that high rainfall as being observed in the recent years was most responsible for the high incidence of gully erosion in the study area as attested to by the 77 respondents which

represented 19.25% of the study population. Improper drainage system is another major cause of gully erosion as indicated by the 65 respondents, which represented 16.25% of the study population.

Table 2: Respondents Perceived Knowledge on Gully Erosion in the Study Area

S/No	Causes of Gully Erosion	Respondent	Percentage (%)
1	Crop Cultivation	23	5.75
2	Overgrazing	20	5.00
3	Deforestation	29	7.25
4	Topography	44	11.00
5	Improper Drainage System	65	16.25
6	Construction Work	59	14.75
7	High Rainfall	77	19.25
8	Laterite Mining	22	5.50
9	Others	61	15.25

Source: Field Survey, 2023.

Construction works without adequate considerations on the channelization of the water ways, are another causes of gully erosion as indicated by 59 respondents which represent 14.75% of the study population. 11% of the study population (44 respondents) agreed that the topography of the area was responsible for the incidence of gully erosion, while 7.25% (29 respondents) indicated that deforestation was the cause. Overgrazing appeared as the least causative factor with 5% representation.

The analysis of the respondents' views on the causative factors of gully erosions in the study area has helped in determining the level of awareness and identification of the gully erosion incidents. This has therefore helped the study to achieve the objective of examining the respondents' perceived knowledge of gully erosion in the study area.

5.4.2 Perceived Consequences of Gully Erosion.

Gully erosion posed serious threat to the well being of the people within the study area. The respondents expressed their concerns about the consequential effects of gully erosion on them (Figure iv). The major consequence as indicated by the respondents was poverty. The 30.5% respondents (183 respondents) agreed that the incidence of gully erosions in their communities had impoverished the people as a result of loss or reduction of income. The extra costs' imposition on an attempt to recover lost

resources, properties and infrastructure, and hardship to come by means of livelihood among others further impoverish the people of the communities.

The next major consequence indicated by the 79 respondents, which represent 13.17% of the study population was damage or loss of properties and other infrastructure. Another group of the respondents are the 27 respondents who are of the opinion that gully erosion has made them to experience loss of social or cultural heritage. The 4.5% respondents believed that there are traditional activities that are no longer in practice as a result of the incidence of gully erosion in their communities. Respondents from Dafara community in Gaube ward of Kuje area council attested to the extinction of the agorobyeta festival, which used to be practiced annually at the base of a mountain in Dafara, but no longer being practiced consequent upon washing away of the shrine site by gully erosion. Other category of the respondents attested to the occasion of separation of communities. Just as the case of separation of Kaida Tsoho and Kutunku Community in the Kutunku ward of Gwagwalada area council (Plate iv). The 6 respondents which represent just 1% of the study population indicated that their communities had been separated as a result of gully erosion.

This analysis therefore helped the study achieved the objective of appraising the respondents' knowledge of the consequences of gully erosion on their livelihoods.

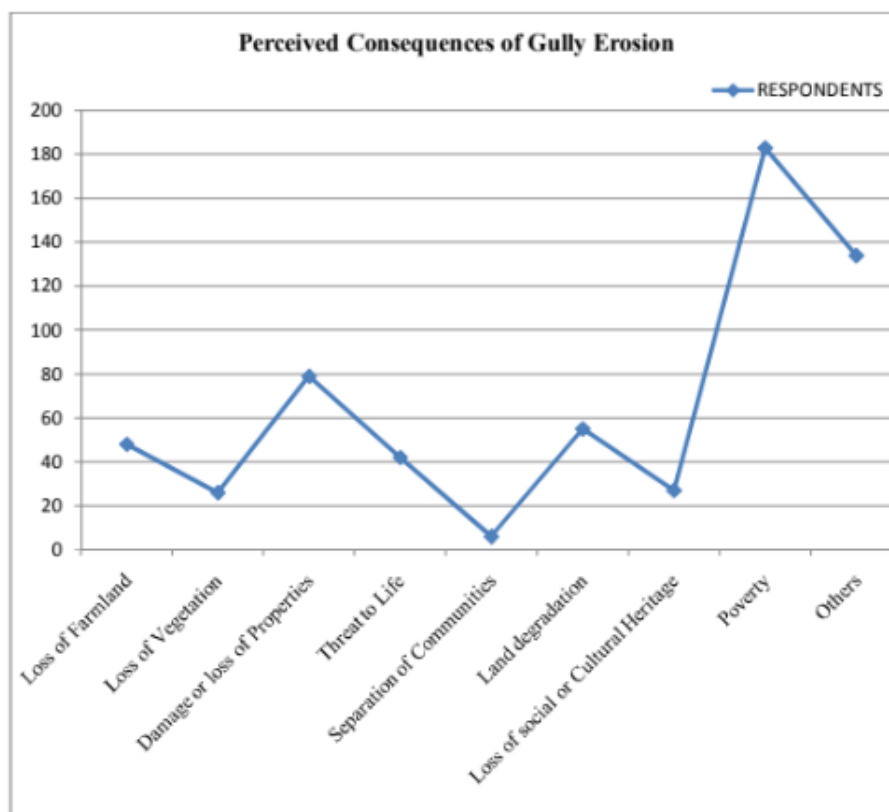


Figure iv: Perceived Consequences of Gully Erosion.

Source: Field Survey, 2023.

5.5 Analysis of Land Intake by Gully Erosion in the Study Area. Gullies in the study area here are characterized by length, width and depth (Table 3). From the table, gully site at Kaida Tsoho has the highest land intake with 5088.2m^2 by area, and the volume of soil washed away amounted to 31546.84m^3 . Also, a gully site at Dafara covered an area of 3276m^2 , while about 14742m^3 quantity of soil was calculated to have been washed away.

Table 3: Land In-Take by Gully Erosion in the Study Area.

S/N	Gully Sites	Length (m)	Width (m)	Depth (m)	Area (m^2)	Volume (m^3)
1	Gwako	148	1.7	1.4	251.6	352.24
2	Giri	236	4.9	3.6	1156.4	4163.04
3	Rafin Zurfi	119	5.4	3.5	642.6	2249.10
4	Wuna	134	8.3	3.9	1112.2	4337.58
5	Kutunku	212	3.1	2.2	657.2	1445.84
6	Ung Fulani	152	2.4	1.5	364.8	0547.20
7	Dagiri	121	5.9	4.3	713.9	3069.77
8	Ung Dodo	129	2.0	1.6	258.0	412.80
9	Paiko Kore	180	3.2	2.8	576.0	1612.80
10	Kaida Tsoho	247	20.6	6.2	5088.2	31546.84
11	Tunga Maje	194	5.8	3.7	1125.2	4163.24
12	Anagada	124	4.5	2.3	558.0	1283.40
13	Pasali	162	6.4	3.9	1036.8	4043.52
14	Kiyi	137	4.2	2.6	575.4	1496.04
15	Kayarda	85	1.1	0.8	93.5	74.80
16	Kuchiyako	128	18.8	5.4	2406.4	12994.56
17	Gwaupe	116	5.7	4.2	661.2	2777.04
18	Dafara	210	15.6	4.5	3276.0	14742.00
19	Zuba	137	3.4	2.8	465.8	1304.24
20	Katse	140	2.3	1.6	322.0	515.20
Total		3111	125.3	62.8	21341.2	93131.25

Source: Field Survey, 2023.

Another gully site at Kuchiyako gulped about 2406.4m^2 by area, while the quantity of the soil washed away was calculated to be 12994.56m^3 . A gully site at Kayarda has the least area of 93.5m^2 with the calculated quantity of soil wash of 74.8m^3 .

In general the total land intake by the 20 gullies in the study area is 21341.2m^2 , while the volume of soil washed away is calculated to be 93131.25m^3 . There are about 305 communities in the study area. The assumption that each community has at least a gully site holds that 21341.2m^2 multiply by 15.25 (that is 305 divided by 20) which gives 325453.3m^2 (0.3254533km^2) as the assumed total land intake by gully erosion in the study area. This represents just 0.01187% of the total land mass of the study area given as 2687km^2 .

5.6 Analysis of the Impact of Gully Erosion on the Socioeconomic Activities in Kuje and Gwagwalada Area Councils.

The analysis of the responses invariably shows the relationship between the socioeconomic engagements of the respondents and the incidence of gully erosion in the study area. It could be observed that all the respondents agreed that there are negative impact of gully erosion on their means of livelihood, but may be 'light' or 'moderate' or 'severe' rate of impacts. This aligned with the work of researchers that states that our environment is a part of our social and economic survival and what happened within the environment we live can impact negatively to our survival (Aliyu, Nura and Olufemi, 2017).

The socioeconomic engagements of the respondents presented as 'X' and the corresponding impact presented as 'Y' (Appendix VII) show the level of relationship between gully erosion and socioeconomic activities in Kuje and Gwagwalada area councils as perceived by the respondents, and are represented in the graph (Figure v). It is observed that arable farming is the most engaged socioeconomic activity in the study area with 99 respondents. Out of the 99, only 27 reported light impact, while 35 reported moderate impact. The 37 majority indicated severe impact on their farming activities. The farmers expressed their concerns about their loss or significant reduction of income as a result of low yields regarding the effects of gully erosion on their farmland. The agricultural farmland has accordingly reduced as expressed by the farmers in a manner that has great impact on their incomes due to gully erosion.

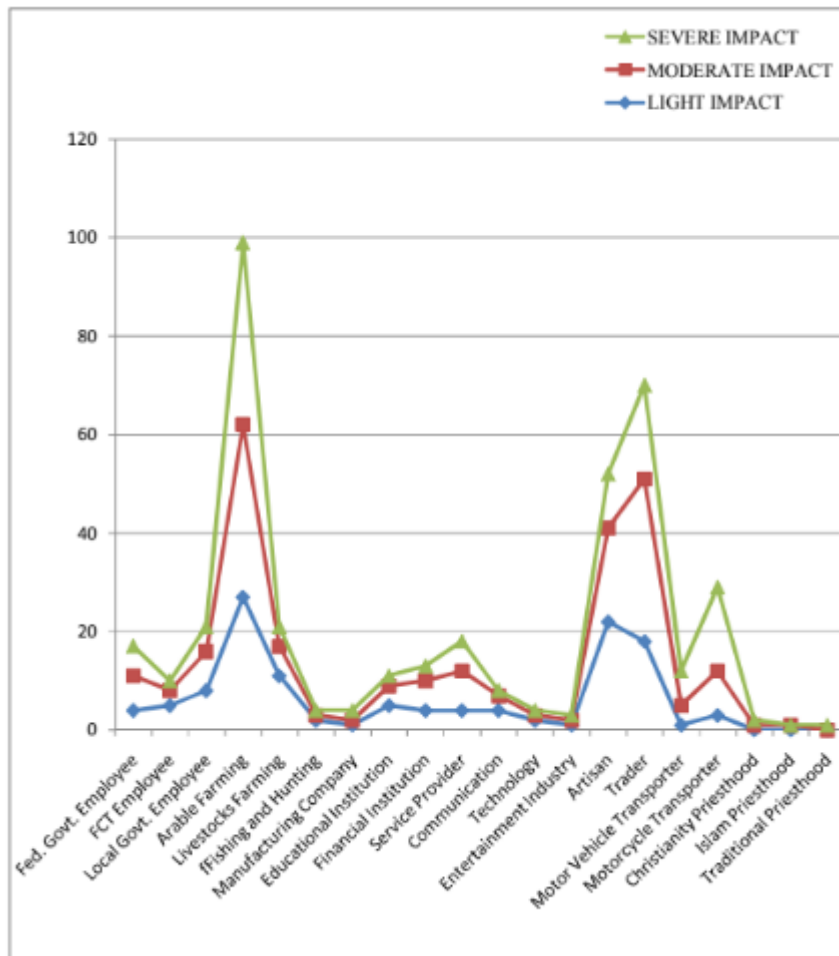


Figure v. Graph showing the Impact of Gully Erosion on the Socioeconomic Activities in Kuje and Gwagwalada Area Councils.

Source: Field Survey, 2023.

Unlike the arable farming, 22 majority out of the 52 artisans reported light impact, 19 reported moderate impact, while remaining 11 marked severe impact. The traders also with 70 respondents reported 18 light impact. The 33 majority reported moderate impact, while the remaining 19 reported severe impact on their trading. On the motorcycle transporter, the majority 17 out of the 29 respondents reported severe impact, while 9 respondents indicated moderate impact and 3 reported light impact. Also, the respondents of motor vehicle transporter were 12, where the majority 7 reported severe impact, 4 reported moderate impact, while the remaining 1 reported light impact. The taxi drivers and motorbike commercial riders expressed their experience on bad roads, the cost of maintaining their vehicles and motorbikes, and the danger of attacks on the bad roads as a result of gully erosion in their communities.

Even though local government employee and livestock farmer share the same number of respondents, 21, the impacts expressed by them are not the same. The local government employee reported 8 light impact, 8 moderate impact and 5 severe

impact, while the livestock farmer on the other hand reported 11 light impact, 6 moderate impact and 4 severe impact respectively. Also, the service provider has the engagement of 18 respondents in which 4 reported light impact, 8 reported moderate impact, while the remaining 6 reported severe impact. Also, Federal government employee, Federal Capital Territory employee, educational institution and financial institution, service provider and motor vehicle transporter with 17, 10, 11 and 13 respondents reported 6, 2, 2 and 3 severe impact respectively. Communication has 8 respondents with 4 reported light impact, 3 moderate and 1 severe impact. Other socioeconomic activities such as fishing and hunting, manufacturing company and technology have 4 respondents, but only fishing and hunting and technology share the same impact distribution of light, moderate and severe impact as 2, 1 and 1 each respectively, while the manufacturing company reported 1 light impact, 1 moderate impact and 2 severe impact. The least engaged socioeconomic activities in the study area are the religious priesthoods where 4 respondents cut across Christianity, Islam and Traditional priesthood which represent just 1% of the study population.

In general, 122 respondents reported for 'light' impacts on their means of livelihood across all the socioeconomic activities. There are also 151 respondents that reported 'moderate' impacts across the socioeconomic activities, while the remaining 127 respondents reported 'severe' scale of impacts. The analyses of the response of the respondents show that the incidence of gully erosion negatively impacted various socioeconomic activities in Kuje and Gwagwalada area councils, but at different levels. The 'Light' level (scale 1-4) impact are those with little shift from the normal flow of interactions thereby inflicting little extra costs on the socioeconomic activities. The shift increases along 'moderate' level (scale 5-6) to 'severe' level (scale 7-10) as the extra costs also increase proportionately. It could also be observed that arable farming has the highest number of engagements and also presented highest number of mean impacts, while priesthood has the least number of engagements with the least mean impacts. This is an indication that the more people are engaged in certain socioeconomic activity, the more they feel the negative impacts of the gully erosion on their respective activities.

5.7 Analysis of the Mitigation, Adaptation and Control Strategies The control measures (Figure vi) used by community in the area include cultivation along contours, tree planting, controlling animal grazing, construction of drainage or channels, sand bagging and others. The response on control measures used by community members in the area indicated that sand bagging is the method most used for controlling gully erosion. The 163 respondents which represent 40.75% agreed that sand bagging has been the major control measure for gully erosion in their community. It is a local method of filling certain woven bags with sand, and using it to fill the bands of the gully or to control its flow. Since the occupational disposition of the study area is predominantly farming, cultivation along contours is another indigenous practice used to combat the menace of gully erosion. The 66 respondents

attested to the method of cultivation along contours and its effectiveness to control gully erosion. Another gully control measure is tree planting where 48 respondents attested to the practice in their communities. The respondents that indicated that construction of channels by local means are 38 which represent 9.5% of the study population. Also, 11 respondents agreed that controlling animal grazing within the local has effectively been practiced, while the remaining 74 respondents indicated other control measures such as back filling and redirection of surface runoff have been supportive in the control of gully erosion in their community.

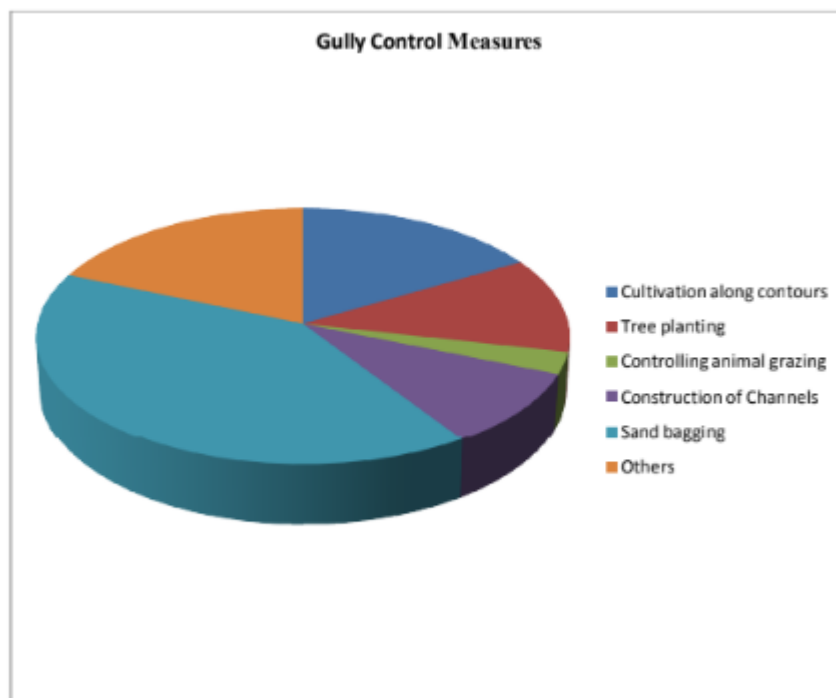


Figure vi: Gully Erosion Control Measures

Source: Field Survey, 2023.

The adaptation strategies devised by the community especially those with degraded lands and those who lost their farmland to gully erosion which resulted into low yield or non-existent yield include community or family supports system where general local banks were created for grains harvests. These grain harvests were later shared among the family or community members. Other strategies include supporting other farmers in their farming activities, while backfilling approach continued in reclaiming most of the lost farmlands. These strategies afforded them the opportunity to earn little income to support their needs, and also provide food for them. Other than the loss of farmland and agricultural produce, some individuals and communities that experienced loss or damage of infrastructure such as perimeter fence or building or road network engaged in the local measures of planks and hard core supports.

From this analysis, it is obvious that the people have the knowledge of gully management techniques but have failed to employ the appropriate measures. This

further affirms the submission of previous researchers that one of major problem of gully control and management is the implementation of the control measures especially from research findings and recommendations (Valentin, Poesen and Li, 2005, and Abdulfatai *et al* 2014).

5.8 Correlation Analysis:

This study therefore adopted the use of correlation analysis to determine if there exist a relationship between socioeconomic activities and emergence of gully erosion in Kuje and Gwagwalada area councils. The SMRC, r_s , computed to be 0.86, 0.98 and 0.93 for the 'light', 'moderate' and 'severe' gully impacts respectively. The respondents' perception of the impact of gully erosion on their socioeconomic activities shows an average SMRC, r_s , of 0.92, which is a large degree of relationship. Therefore, the average coefficient of determinant, r_s^2 is 0.85, which shows that gully erosion is responsible for 85% among factors affecting socioeconomic activities in the study area.

5.9 Summary of Findings

Gully erosion has been recognized as one of the major global environmental problems caused by soil erosion. Many States in Nigeria including FCT are currently under the threats of this phenomenon. The study therefore identified active gully erosions with an average age of 8 years having average depth, width and length of 3.14m, 6.27m and 155.55m respectively in Kuje and Gwagwalada area councils.

Among the 20 identified socioeconomic activities in the study area, arable farming has the highest engagements represented by 24.75% of the study population. Coupled with the livestock farming which has 5.25% representation, farming therefore occupied 30% of the socioeconomic activities. Close to this are the trader and artisan with 17% and 13% representation respectively.

The knowledge of the respondents, coupled with their mature age groups gave the expected impression of satisfying information on the subject of gully erosion in the study area. The findings indicated that the respondents were familiar with the incidence of gully erosion, and aware of its implicative effects on their wellbeing. Also, the major factors causing gully erosion are high rainfall as supported by 19.25% of the study population, followed by improper drainage system with 16.25% of the respondents. Others factors include construction work, topography, deforestation, crop cultivation and sand mining.

The respondents' personal traits significantly influenced the level of their perceptions of the problems in the study area. The major consequence as indicated by the respondents was poverty. The 30.5% of the study population agreed that the people had been impoverished due to the loss or reduction of income by the incidence of

gully erosions in their communities. Another consequence indicated by 13.17% of the study population was damaged or loss of properties and other infrastructure such as bridges and roads, and loss of utility installations.

From the field, the total land intake by the 20 gullies in the study area is estimated to be 21341.2m^2 , while the volume of soil washed away is calculated to be 93131.25m^3 . By implication, about 325453.3m^2 area of land is estimated to have been taken by gully erosion from the study area. Also, about 1420251.56m^3 quantities of soil have been washed away from the study area.

However, all the respondents agreed that there are negative impacts of gully erosion on their means of livelihood, but may be 'light' or 'moderate' or 'severe' rate of impacts as indicated in the scale. The arable farming which is the most engaged socioeconomic activity in the study area with 99 respondents has only 27 reported light impact, while 35 reported moderate impact, and the 37 majority indicated severe impact on their farming activities. This supported the findings that the more socioeconomic engagements, the more the impact of the gully erosion.

The two basic gully control measures employed in the study area are the mechanical and biological techniques. The mechanical measures include sand bagging, cultivation along contours, construction of channels and backfilling to control gully erosion process. The biological measures engaged in vegetation growth on the slopes and along the gullies to reduce the impacts of runoff. Among other local measures adopted by the inhabitants of the Kuje and Gwagwalada area councils that are fairly effective are measures to control grazing, control of bush burning, and planting of cover crops. The spearman rank correlation coefficient adopted statistically for this study showed that there is a large degree of relationship between the impacts of gully erosion and the socioeconomic activities in the study area.

6 CONCLUSION

From the study, gully erosion is a serious environmental problem in the study area. Major causes of gully erosion in the area were natural coupled with human induced activities and negligence. The implications of which include threats to life, loss or damage of properties and other infrastructure, separation of communities, exorbitant transport fares, high cost of commodities, loss or reduction of income, and loss of social, religious and cultural heritage which have exposed the inhabitants of the study area to economic hardship. The control methods have not been very effective in controlling the menace, hence the increase in the rate of gullies. The study therefore recommends integration of the local people and environmental stakeholders in the gully erosion management programme of the governments.

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