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Evaluation of the Socio-Economic Impacts of Gully Erosion in Nkpor and Obosi

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Abstract
The study conducted a comparative analysison the socio-economic impacts of soil erosion in Nkpor and Obosi. In doing this, questionnaires were administered randomly to the residents. The data generated were analyzed using cross tabulation, descriptive statistics, two sample T-Test and Z-Tests statistical techniques due to their nature. The results showed there is no serious variation between the socio-economic impacts of erosion in both communities. Furthermore it also showed that erosion have caused serious socio-economic impacts on the inhabitants of the area. Consequent upon the findings, the following recommendations were made: That there is a great need to conscientize the inhabitants of both Nkpor and Obosi and other flood susceptible areas of these environmental and socio-economic effects of flooding and the need for all to join in combating it, there should be development of an Integrated Environmental Management Programme (IEMP) for the state based on the principles of sustainable development to help tackle both the challenges of erosion and other environmental hazards. .

INTRODUCTION

BACKGROUND TO THE STUDY

In Nigeria, soil erosion is the most serious problem affecting a large proportion of urban and rural environment in South Eastern Nigeria (Uchegbu, 2002). It can be defined as the loosening or the process of detachment and consequent removal or transportation of soil materials from one location to another by agents of erosion such as wind, water and ice. (Faniran and Adeola, 1978; Nnodu, 2005; Onwuka, 2008).

The aftermaths of these erosion activities are the destruction of agricultural lands, loss of ancestral homes and properties to devastation of roads and other infrastructural facilities (Uchegbu, 2002; Nnodu, 2005). It is based on this premise that this study seeks to investigate the effects of soil erosion on the social and economic lives of the inhabitants of Obosi and Nkpor in Anambra State.

STATEMENT OF PROBLEM

In Anambra State, the word erosion is synonymous with death and destruction. Over 20% of the total landmass of Anambra state is being devastated at one stage or another by flooding and gully erosion (Egboka, 1993). Of all the states in the South Eastern Zone, Anambra State has been identified as the worst hit having about 1,000 active erosion sites in its domain (Egboka, 1993).

In contemporary times, it can easily be put as the greatest scourge ravaging the state (Nnodu, 2005). Gully erosion and landslides are terminal and cancerous ecological diseases that destroy within minutes or at most hours; land formed over million of years (Egboka, 1993).

According to Egboka (2007), the problems resulting from soil erosion in the state are so many and are varied too. They include human, material, political, psychological, sociological, economical and spiritual all rolled in one.

Nkpor has a landmass of 13.88 Sq km with a total projected population of 106, 413 people (NPC, 2006). The Community has more than 7 erosion sites in various stages of development (Egboka, 1993).

About to 2.09sqkm of the landmass of Nkpor has been lost to soil erosion, this constitutes 15% of the total land area (Ministry of Environment, Awka, 2006). The implication is that 16, 023 people have been made homeless or affected in one form or the other. Some of these sites cover up to one square kilometer and range from 10 – 15 meters in width to 15 – 25 feet in depth (Ministry of Environment Awka, 2006).

Obosi has a landmass of 16.973 sq km with a total projected population of 140, 141 people. The community has more than 14 erosion sites at various stages of development (Egboka, 1993).

About 4.02 sq km of the landmass of the area has been lost to soil erosion, this constitutes 23.7% of the total land area (Ministry of Environment Awka, 2006). The implication is that 33, 191 people have been made refugees or abandoned their homes in this community. The gully sites usually cover more than one square kilometer and range from 10 – 15 meters in width to 15 – 30meters in depth (Ministry of Environment Awka, 2006).

Unfortunately most of these sites are located at the heart of these urban centers. Moreover, these towns are known for multiplied economic activities like trading, agricultural activities, industrialization and transportation activities.

This is to say, going by how soils of the areas are being ravaged, that these activities are in serious danger of being badly affected. The implications of this are that the inhabitants of the area and even people from distant places who depend on these activities are in serious danger of losing their means of livelihoods. This definitely will affect their lives.

It is to this effect that this study assessed the socio-economic impacts of gully erosion in Obosi and Nkpor with a view to proffering solution to the menace.

STUDY AREA

The figure 1 below is the map of Nigeria showing Anambra state while figure 2 presents the map of Anambra State showing the study area.

Figure 1: Map of Nigeria Showing Anambra State

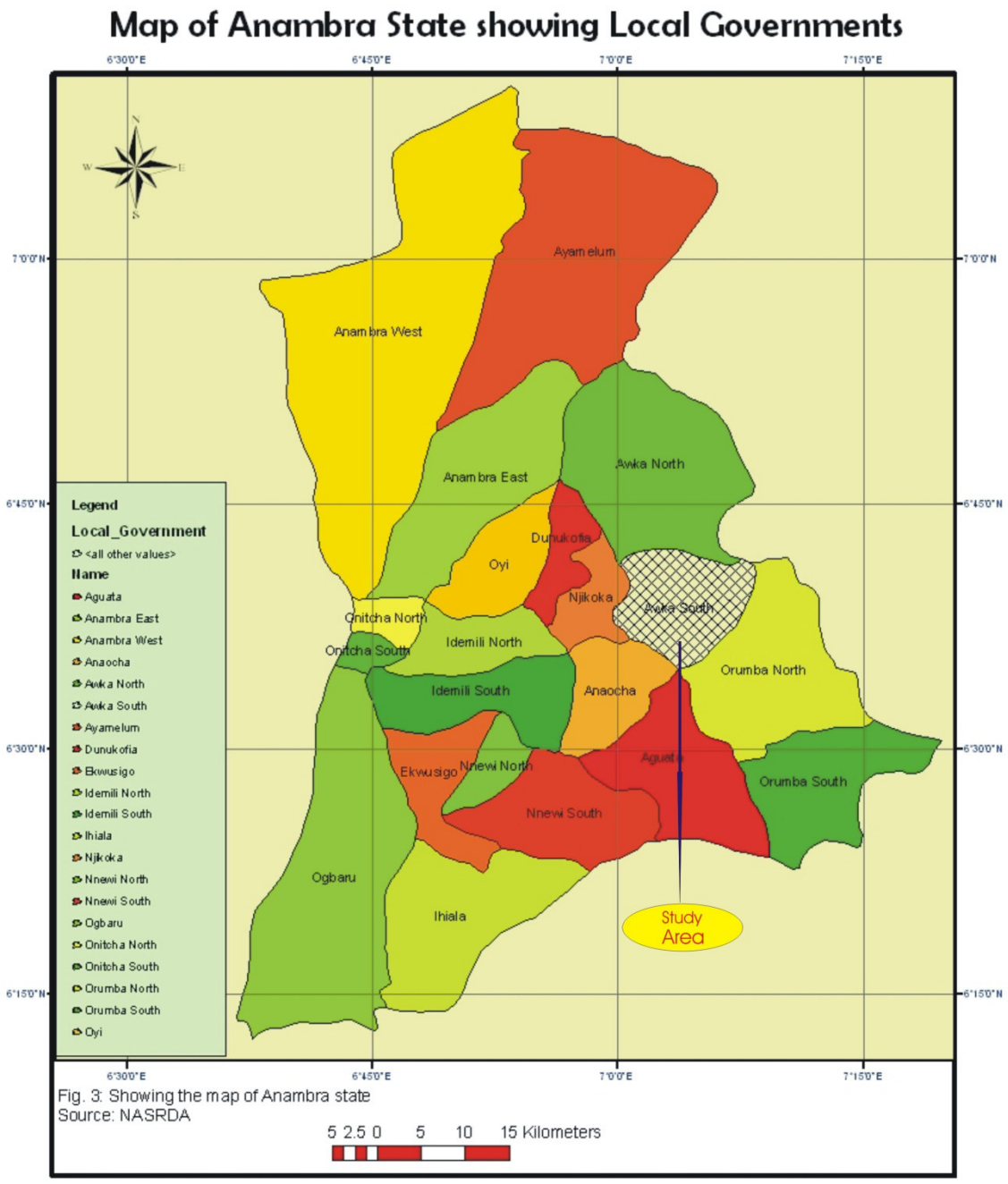

Figure 2: Map of Anambra State Showing the Study Area

LOCATION AND EXTENT

Anambra State is located within latitude 6^{o} 48' N and Longitude 6^{o} 37'E on the North and Latitude 5^{o} 40'N and longitude 7^{o} 27'E on the South. It has a total land area of 4,416sqkm (Geological Survey Awka, 2000). Based on the 1991 population census conducted in 2006, the population of Anambra State rose to 7,821,858 with a density of 863km^{2} (NPC, 2006).

OBOSI AND NKPOR

Obosi and Nkpor are communities that make up Idemili North Local Government of Anambra State. Obosi has latitude of 5^{o} 43' and longitude of 6^{o} 35'E with a landmass of 16.973sqkm. It is bounded on the North by Onitsha, on South by Oba, on West by Atani and on East by Umuoji. Nkpor has latitude of 6^{o} 12'N and longitude of 6^{o} 36'E. It is bounded on the North by Ogbunike, on South by Obosi, on West by Onitsha and on East by Ogidi. It has a landmass of 13.885km. They have a population of 246, 554 people (NPC, 2006).

AIM OF STUDY

The aim of this study is to comparatively analyze the socio-economic impact of soil erosion on the inhabitants Nkpor and Obosi in Anambra State of Nigeria.

LITERATURE REVIEW

SOCIO-ECONOMIC EFFECTS OF SOIL EROSION

Shakuri and Nadzhafova (1983) studied the changes in fertility and composition of plant ash due to erosion for the main soil types on the Southern slopes of the big Caucasus mountain in Palouse River Basin, using laboratory analysis. Results showed that the average wheat yields basins wide are 22% less than what would have been if erosion were controlled over the past 50 years. They stated that it led to the wheat farmers losing 1/3 of the increased productivity provided by technological improvement in the past 50 years.

Sinden et al (1990) studied the Damage Cost of Land Degradation in Australia. They used the cost benefit analysis method in measuring the economic loss by soil erosion, Their result showed that in places like New South Wales, soil erosion of 3cm reduced yields of 39% in 1980 and 11% in 1981. It also led to the reduction of loss of 121, 000km^2

Pierece and Stathers (1988), worked on "The Environmental Impacts on Cereal Grain Production in the Canadian Prairie Province", using an estimation growth constraint model. The result shows that 8% yield loss due to wind erosion and 5-7% to water erosion in Canada. In Debre Breham, work done by Morgan et al (1987) on soil erosion in the United Kingdom. They made use of interview survey on the farmers, to collect data on yield. Through further analysis, the results showed that there was a huge reduction in crop yield as in old days, grain yields were up to 100-150 tones/km^2/year. But now, due to the presence of erosion, current yields have been observed to be 20 tones /km2/year.

Szabo (1992) performed a study on Erosion Damage in Hungary. He collected several data from local farmers on crop yield in different landscapes in Hungary. Through the analysis on each data he obtained, the result showed that on badly eroded fields, crop yields are 20 – 30% less than on flat fields. On degraded (moderately) fields, yields are 10 – 30% less and on less eroded soils yields are 0 – 20% less.

Evans (1996), conducted a research on soil Erosion and its Impact in England and Wales. He used both field survey and experimental analysis on water quality. Through his results, the impact of soil erosion in England and Wales were loss of biodiversity, siltation of water bodies, eutrophication which led to contamination of drinking water and damages to roads and footpaths. He concluded by saying that human activities should be intensively supervised in order to prevent the incidence of soil erosion.

In Ontario, Omafra (2003) studied "Onsite – Effects and Off – Effects of soil Erosion, using questionnaire distribution. The result showed that the Onsite effects of erosion in the study area was the removal of valuable top soil, reduction in crop emergence and yield, loss of natural nutrients and organic matter in the soil which resulted to soil quality and structure being affected. The off-site impacts of soil erosion shown by the results included sedimentation of streams and water courses, clog drainage ditches and stream reservoir, pollution of down stream water sources by pesticides and fertilizers.

Crosson (2003) evaluated soil quality and agricultural development in United States using an estimation model; he estimated that in terms of losses due to soil erosion, farm income lost range from a high of $25 billion per year to a low of $100 million per year.

In Spain, Hardley (2005) analyzed the social benefits of soil conservation and measures. He adopted two stated preferences, namely choice experiments and contingent evaluation. Through the result from the choice experiments, it was observed that soil erosion had impacts on the water quality and on the wildlife in the study area of Andalusia, Spain. Rhoton et al (2008), studied "The identification of suspended sediment sources", using soil characteristics in a semi-arid watershed in Walnut. They collected soil samples from a nearby eroding area, the soil were sampled along transects in six watersheds. The results showed that sediments in the watershed had similar characteristics with soil samples from the eroding area which signified high level of sediments in the watershed resulted from erosion activities.

In China, Ming et al (2006), performed a research on partitioning the contributions of sheet and Rill erosion. They made use of environment radio-nuclides, as sediment tracers on small erosion plots. Their result showed that both rill erosion and sheet erosion were responsible for the changes in sediment quality being eroded away.

Dave (2003) in his online edition, "The Effects of Soil Erosion", using field survey he observed that the main On-site impact of soil erosion is the reduction in soil quality which results from the loss of nutrients-rich upper layers of the soil and the reduced water holding capacity of many eroded soils.

Massee (1990) and Malhietal (1994) studied influence of top soil removal on soil fertility, barely growth and winter wheat cropping in United States of America. Using the techniques of top soil removal, they noted that erosion has impacted on crop yield and showed yield difference of 281 over a 5-year period due to more erosion.

Biggelaar et al (2001), studied the effect of future erosion on crop grain yield at Colombia, South America; using the technologies of top soil removal to vary the effective rooting depth. Their study showed that top soil; removal has an effect on the tuber yield of cassava (Mainhoc Esculenta).

Biggelaar et al (2001) studied the effects of future erosion on crop grain in United States of America and Canada. Using the technique of top soil removal to vary the effective rooting system, they estimated that erosion caused loss in production for the United State ranged from 0.4 to 4.2% per cm of soil eroded and from 0.30 to 0.27% per year of total production Biggelaar et al (2003) conducted a study on the global impact of soil productivity in North America, Europe and Australia. Using the technique of top soil removal to vary the effective rooting depth, they observed that absolute yield loss by erosion ranged between 0.5 and 1.4kg/ha/mg of soil erosion for grain and leguminous crop and 0.7 to 12.7kg/ha/mg for root crops.

Lal (1998) carried out a study on soil erosion impact on Agricultural productivity and environmental quality in North America. He reported that accelerated soil erosion adversely affects agronomic productivity onsite and environment (water and air) quality offsite.

In the African continent, Pettry et al (1985); Fahnstock et al (1996) studied the effect of topsoil thickness and horizonation of a virgin coastal plain soil on crop grain yields on Tanzania, using field observation technique. His study showed yield reduction of maize (Zea Mays) due to reduction in Africa during 1970 – 1990 due to water erosion alone was estimated to be 8%.

In Nigeria, Nest (1991) assessed the extent of Gully erosion in South-Eastern Nigeria using questionnaire. He noted that gully erosion prone areas have become bad land environments as people are usually forced to relocate in Gully erosion.

In Anambra State Egboka (1993) using field survey noticed that 20% of the land of Anambra State is presently being ravaged or threatened by erosion at various levels of development and stages of maturity and over 20% of the land has been lost to gullies. He observed that lives and properties are regularly lost, stating that houses with entire families living in them have often been swallowed up. This work does not doubt the saying by Northcliff and Gregory (1992) that erosion claims lives in a very quiet but massive way.

Olife et al (2008) studied "The Effects of Soil Erosion on Trace Elements in Nanka and Oba towns of Anambra State". They collected soil samples and water samples which were analyzed using the Atomic Absorption Spectrophotometer. The results showed that soil erosion led to the reduction of trace elements in the two communities.

Ashuma (2005) studied soil erosion problems in Bendel State, using using Igueben town as case study. Through experimental analysis of soil samples, his result showed that soil has caused reduction in soil fertility due to a reduction in the amount of microelements in the soil. This work lasted for three months.

GAPS IN LITERATURE

From the works reviewed above some undeniable gaps are very glaring and this constitutes the core of this work. Also, even though there are documented works on erosion reviewed, same of them are now outdated and there must have been reasonable variations e.g. Higgins (1960), Fournier (1960, 1972) etc.

Moreover, among the works done in South Eastern Nigeria like Ofomata (1979), Nwajide (1979), Igbozurike (1989), none conducted a study on Nkpor and Obosi as case studies.

METHODOLOGY

The study adopted survey design. In the survey design, questionnaire method was employed in collecting information on the causes of erosion in Nkpor and Obosi, the effects of soil erosion on social and economic activities, and impacts of soil erosion on the residents of Nkpor and Obosi.

The number of questionnaires distributed was determined using the Yaro Yamine (1994) formula.

$$\frac{N}{1+ N (e)^2}$$

Where N = Population of the number of household.

I = Unity (Constant)

e = Error estimate (0.05)

But following Nwana (1981), if the population is a few hundreds, a 40% sample will do, if many hundreds, a 20% sample will do. If a few thousands, a 10% sample and if several thousands, a 5% or fewer sample will do

Since Nkpor and Obosi population figures for 2006 have not been released. The Census figures of the 1991 for the two towns were 64, 732 and 85, 249 (NPC, 1991). The figures were projected to 2009 using the exponential growth formula with a growth rate of 0.028 as used by the Population Commission in their 1996 projection.

The population figures obtained was 106, 413 and 140, 141 for Nkpor and Obosi respectively. The total number of households obtained was 31, 820 and 40, 000 (NPC, 2006).

Table 3.1: Sample Size Distribution of Questionnaire

Communities	Number of questionnaires distributed	Number of Questionnaire returned	Percentage (%) returned rate
Nkpor	99	72	73
Obosi	99	66	67
Total	198	138	

Source: Author's Field Work (2009).

In analyzing the data obtained from the questionnaire to meet up the objectives of the study, appropriate descriptive statistical tools were employed. In determining the average value of the parameters studied and for easy computation and testing of the hypothesis, the mean which is measure of central tendency was applied. The mean was determined by the formula:

$$X = \frac{\sum X}{N}$$

Where X is the value obtained for each sample.

N is the number of samples

$\sum$ is the summation

Source: Pelosi et al (2003).

The responses from the questionnaire survey were analyzed using cross Tabulation, Mini Tabulation and Means. In testing for the three hypotheses, the one sample T-Test, Two-Sample T-Test and Z-Test were used.

For testing hypothesis about the population distribution of samples

(n < 30), we use the following formula:

$$t = \frac{\bar{X} - \mu}{S/\sqrt{n}}$$

Where:

$\bar{X}$ = Sample Mean

μ = Population Mean

S = Sample Standard Deviation

n = Number of observations

For two Samples T-Test, the formulae is:

$$t = \frac{X_1 - X_2}{\sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}}}$$

Source: Pelosi et al (2003).

Also, for testing hypothesis about the differences between two populations means when normal distribution of Samples (n > 30), we use the formula:

$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

OR

$$Z = \frac{(\bar{X}_1 - \bar{X}_2) - 0}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where $\bar{X}_1$ and $\bar{X}_2$ – the sample means of the two different random samples.

n_1 and n_2 - Size of the samples.

S_1^2 and S_2^2 – the standard deviation of the 1st and 2nd populations respectively

When the population standard deviations are unknown, the sample variances S_1^2 and S_2^2 were used to approximate them (Pelosi et al 2003).

DATA PRESENTATION / ANALYSES

This section analyses data on general information that is bio-data, using cross tabulation. The cross tabs were on sex-age, sex-length of stay, sex-education and sex-occupation.

Table 1: Cross – Tabulation on Sex-Age

Issues Raised	Outcome (Age Interval)							
Sex * Age	18-21	22-25	26-30	31-40	41-50	51-60	> 60	Total
Male	6	10	10	20	12	6	2	66
Female	10	16	12	10	14	2	8	66
Total	16	26	22	30	26	8	10	138

Source: Author's Field Work (2009)

From table 1, sex-age intervals was grouped into seven groups of 18-21, 22-25, 31-40, 41-50, 51-60, >60. Out of a total number of 138 respondents cross tabulated in both communities, the male have the highest number of 20 respondents which falls between age group of 31-40. The highest numbers of female were found to be 16 and it falls within the age interval of 22-25.

Also, the total numbers of female respondents were found to be 12 while that of male was 66. This implies that a greater number of female responded to the questionnaire distributed.

Table 2: Cross-Tabulation on Sex duration of stay

Issues Raised	Outcome				
Sex*Length of stay	<5 years	6-10 years	11-15 years	16 and above	Total
Male	12	16	22	16	66
Female	16	24	12	20	72
Total	28	40	34	36	138

Source: Author's Field Work (2009)

From the table 2, the Cross-Tabulation of sex with length of stay showed that greater number of female (24) have stayed between 6 – 10 years while the highest number of male (22) have stayed between 11 – 15 years. The last number 12 represents the lowest number of populations for both male and female which can be found within the age group less than 5 years and 11 – 15 years. The sum total numbers of 40 representing both sexes were recorded within the age interval of 6 – 10 years while the lowest numbers of 28 were recorded within age interval of less than 5 years.

Table 3: Cross-Tabulation on sex-level of education

Issues Raised	Outcome					
Sex*Length of education	WAEC or NECO	Sex*Length of education	WAEC or NECO	Sex*Length of education	WAEC or NECO
Male	22	Male	22	Male	22
Female	34	Female	34	Female	34
Total	56	Total	56	Total	56

Source: Author's Field Work (2009)

Table 3 above showed that out of 138 respondents, 56 of the respondent's were school certificate holders. This could be as a result of predominance of commercial activities in the two communities which are in close proximity. 44 represent the respondents holding NCE, OND and TCII which were found in primary and post primary schools. The last number 4 were found among those with First School Leaving Certificate (FSLC). The majority of the respondents 34 representing female were school certificate holders while 26 representing the highest number of male were holders of other degrees.

Table 4 Cross-Tabulation on Sex Occupation

Issues Raised	OUTCOME					
Sex*Occupation	Medical Practitioners	Civil Servants	Farmers	Traders	Students	Others
Male	12.1	18.2	15.2	42.4	3.0	9.1
Female	2.8	25.0	11.1	36.1	19.4	5.6
Total	14.9	43.2	26.3	78.5	22.4	14.7

Source: Author's Field Work (2009)

From table 4 above, 78.5% representing the highest was recorded for traders. This is as a result of prevalence of various economic and commercial activities. Some examples are machine spare parts (Mgbuka), Electrical market and Afor Nkpor etc. The lowest number of population was 14.9% representing others

occupation not indicated. Civil servants recorded 43.2% while 26.3% represents the farming population. The total number of students was 22.4%.

According to Pelosi et al (2003), using the 5-point Likert Scale, when the mean statistics is 3.00, it implies that there is no opinion on the particular question. Mean statistics greater than 3.00 indicates a positive responses i.e. a general agreement on a particular question while mean statistics less than 3.00 indicates a negative response i.e. a general disagreement on a supposed question. The information is presented on tables and graphs only.

Table 5: Descriptive statistics for social activities affected in the areas studied.

Descriptive Statistics for social activities in the areas studied

	N	Sum	Mean		Std.
	Statistic	Statistic	Statistic	Std. Error	Statistic
soceffect1	138	560	4.06	.077	.902
soceffect2	138	490	3.55	.109	1.285
soceffect3	138	396	2.87	.114	1.334
soceffect4	138	324	2.35	.095	1.118
soceffect5	138	436	3.16	.112	1.319
soceffect6	138	546	3.96	.090	1.059
soceffect7	138	574	4.16	.076	.898
soceffect8	138	550	3.99	.090	1.060
soceffect9	138	394	2.86	.112	1.316
Valid N (listwise)	138				

Source: Author's Field Work (2009)

From the table above, there was strong agreement by the communities that soil erosion causes loss of lives, traffic congestion, and poor health condition, and psychological trauma, migration of people and displacement of families which could be deciphered from the mean scores of 4.06, 3.55, 3.16, 3.96, 4.16, and 3.99 respectively.

The socio-cultural lives of the populace have been severely affected. The lands have become very scarce. Corpses are carried to far away places for burial. Sometimes the earth just opens its mouth widely and swallows men and material. These double edged multifaceted monsters are ugly vultures and carrion feeders that continue to devour our people alive, and unearth our sleeping heroes from their final resting places.

A major gully has cut across the road leading into St. Mary's Church Obosi. It is now a hazardous venture to skirt across the monstrous gully to go to church and pray. Erosion and landslide have thus, affected adversely the religious lives of the people, thereby attacking the body and soul of the people: the physical and spiritual, hence perpetuating physico – spiritual damages to our people.

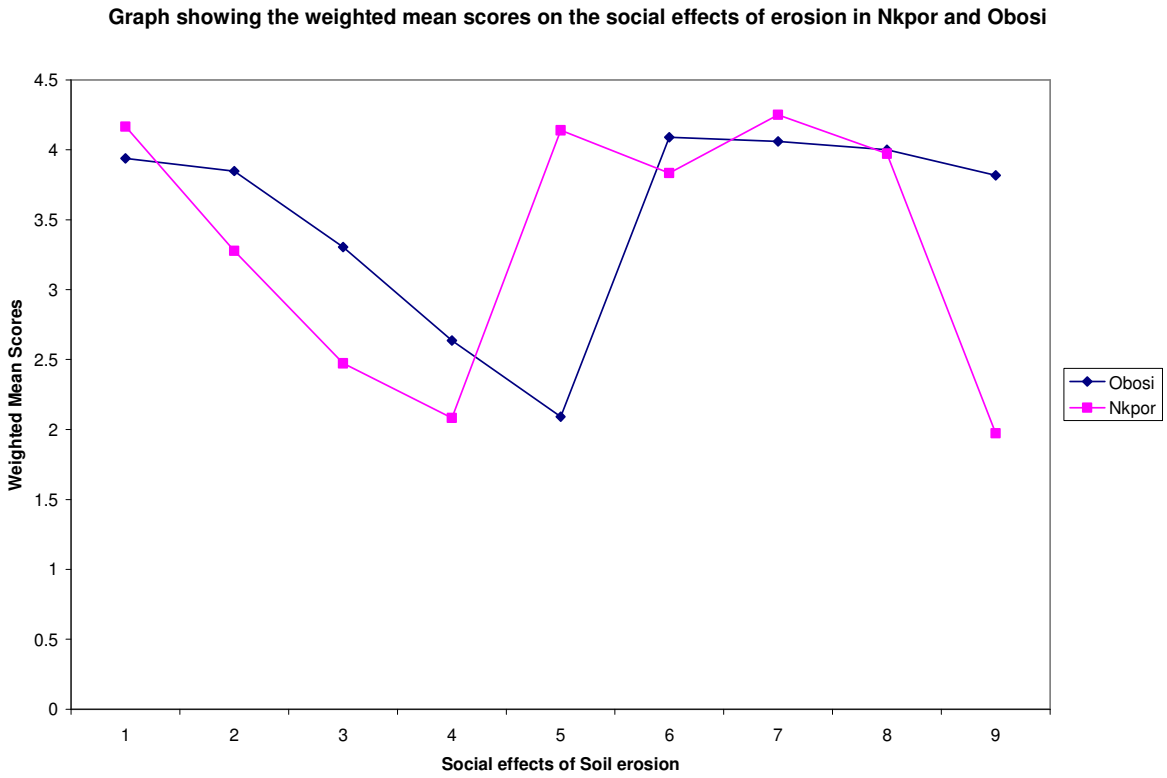

Fig. 3: Graph showing the comparison of mean score of social impacts of soil erosion

The graph seeks to compare the mean statistics of social effects or implications of soil erosion in Nkpor and Obosi so as to identify possible differences and potential agreements. The straight line represents Obosi community while the dotted line represents Nkpor community.

From the graph above, the two communities were of converse opinion on whether soil erosion causes impairment of relationship, poor health condition and increase in crime rate. The graph shows that Obosi communities were of the opinion that erosion causes impairment of relationship increase in crime rate while Nkpor community was of different view. Nkpor communities were of the opinion that poor health conditions can result from erosion. This could be seen from negative health implications of dumping of solid waste, scrap metals etc on erosion sites in Mgbachu. It can form fertile ground for breeding of anopheles mosquito that causes malaria.

Table 6:

Descriptive Statistics for social activities in the areas studied

	N	Sum	Mean		Std.
	Statistic	Statistic	Statistic	Std. Error	Statistic
soceffect1	138	560	4.06	.077	.902
soceffect2	138	490	3.55	.109	1.285
soceffect3	138	396	2.87	.114	1.334
soceffect4	138	324	2.35	.095	1.118
soceffect5	138	436	3.16	.112	1.319
soceffect6	138	546	3.96	.090	1.059
soceffect7	138	574	4.16	.076	.898
soceffect8	138	550	3.99	.090	1.060
soceffect9	138	394	2.86	.112	1.316
Valid N (listwise)	138				

From the above table, Obosi community agreed that soil erosion have caused loss of lives, traffic

congestion, impairment of relationships, psychological trauma, migration of people and displacement of families. They were of divergent opinion on some social effects such as reduction in standard of living and increase in crime rate.

In Irre village of Obosi, the death of 13 years old – John Nwosisi, when he plunges headlong into the gully erosion, about 4.02sqkm of the landmass of the area has been lost to erosion, this constitutes 23.7% of the total landmass (Ministry of Environment Awka, 2006). The implications are that 33.191 people have been rendered homeless and from estimation, up to thirty two families have left their homelands and become refugees (Ministry of Environment Awka, 2006). This has resulted to impairment of relationships as cultural values heritage are lost. A cursory look shows families living at the edge of gullies. Some have to construct lake or ditch to prevent runoff from roof top and catchments areas. They all concurred that they are living with palpable fear and psychological trauma whenever the rainy season commences. This information deduced from their responses justifies the opinion of Egboka (2003) and Onwuka (2008), those erosional activities affect the people mentally, socially, economically and spiritually. This also justifies Nwogbo (2008) assertion that movement of people away from their communities leads to loss of business, social and cultural values.

From the above table, the Nkpor community confirmed that soil erosion has caused loss of lives, traffic congestion, and poor health condition, and psychological trauma, migration of people and displacement of families. About 2.09sqkm of the landmass of Nkpor has been lost to soil erosion. This constitutes 15% of the total land area (Ministry of Environment Awka, 2006). The implication is that 16, 023 people have been mode homeless or sought refuge elsewhere.

ECONOMIC EFFECTS

This section treats analysis of descriptive statistics on economic impacts of erosion. According to Pelosi et al (2003), using the mean statistics of 3.00, it implies that there is no opinion on the particular question. Mean statistics greater than 3.00 indicates a positive response i.e. a general agreement on a particular question while mean statistics less than 3.00 indicates a negative response i.e. a general disagreement on a supposed question. The information is presented on tables and graphs only.

Table 7:

Descriptive Statistics for the economic effects of erosion in Obosi

	N	Sum	Mean		Std.	Variance
	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
econeffect1	66	272	4.12	.136	1.103	1.216
econeffect2	66	298	4.52	.087	.707	.500
econeffect3	66	248	3.76	.122	.993	.986
econeffect4	66	288	4.36	.091	.737	.543
econeffect5	66	204	3.09	.163	1.321	1.745
econeffect6	66	138	2.09	.120	.972	.945
econeffect7	66	224	3.39	.173	1.402	1.966
Valid N (listwise	66					

Source: Author's Field Work (2009)

From the table above, the community pointed out that the soil erosion has led to loss of farmland, loss of farm produce, loss of income, loss of properties, increase in price of goods and services and destruction of social infrastructure. This can be seen from the mean scores of 4.12, 4.52, 3.76, 4.36, 3.09 and 3.39 respectively. Also, there was 98% agreement on such economic effects like loss of farmlands, loss of farm produce and loss of property in Obosi. According to Ofomata (1984), one of the major properties affected by soil erosion is farmland. This invariably causes loss of farm produce. The residents of Obosi are mainly subsistence farmers combining trading and farm work. As a result, the loss of large areas of land to gullies, the incidence of impoverishment of the remaining ones is rampant. The fertile top soil is being eroded into the gullies leaving only the infertile sub-soil. Moreover, the scarcity of plain farm lands has led to the over cultivation of the few remaining ones. This means that even though some soil is still physically present, it is highly deficient in plant nutrients and gives low yields to the subsistent farmer. In most cases, the gullies have spill over of water and sands during rainstorms leading to invasion of farmlands by the violently moving flood water and sediments

thereby causing untold damage to the crops and the farmlands.

Also, major properties affected by erosion in Obosi includes schools such as Obosi Girls A, Obosi Girls B in Ugamuma village. Furthermore, churches and other structure have been lost to soil erosion such as St. Mary's church. Various properties worth millions of Naira have been lost in Obuofia – Umuota, Odoaraba, Amagbologu. This justifies Egboka (2003) who stated that losses to gullies include lives, roads buildings and farmlands.

Table 8:

Descriptive Statistics for the economic effects of erosion in Nkpor

	N	Sum	Mean		Std.	Variance
	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
econeffect1	72	286	3.97	.123	1.048	1.098
econeffect2	72	126	1.75	.076	.645	.415
econeffect3	72	274	3.81	.111	.944	.891
econeffect4	72	284	3.94	.122	1.033	1.067
econeffect5	72	180	2.50	.157	1.332	1.775
econeffect6	72	274	3.81	.142	1.206	1.455
econeffect7	72	292	4.06	.118	1.005	1.011
Valid N (listwise)	72					

Source: Author's Field Work (2009)

From the above table, Nkpor community were of conclusive opinion that soil erosion have caused loss of farmland, loss of income, loss of properties, siltation of water bodies and destruction of social infrastructure. The evidence can be seen on the effect of soil erosion in Nkisi forest reserves, properties such as buildings along Agulu Avenue have been lost to erosion. Public and private infrastructures such as the Greater Onitsha water scheme have been lost to siltation while Nkpor motor spare market has not been spared. The gullies pull down electric poles while micro tremors arising from the landslides crack building and concrete walls. The flood water cut roads and telephone cables. These damages must be regularly repaired and this takes a heavy chunk of the financial reserve of the country and the state.

The graph seeks to compare the mean statistics of economic activities affected by soil erosion in Nkpor and Obosi. This is to identify possible differences and potential agreements. The straight line represents Obosi community while the dotted lines represent Nkpor community.

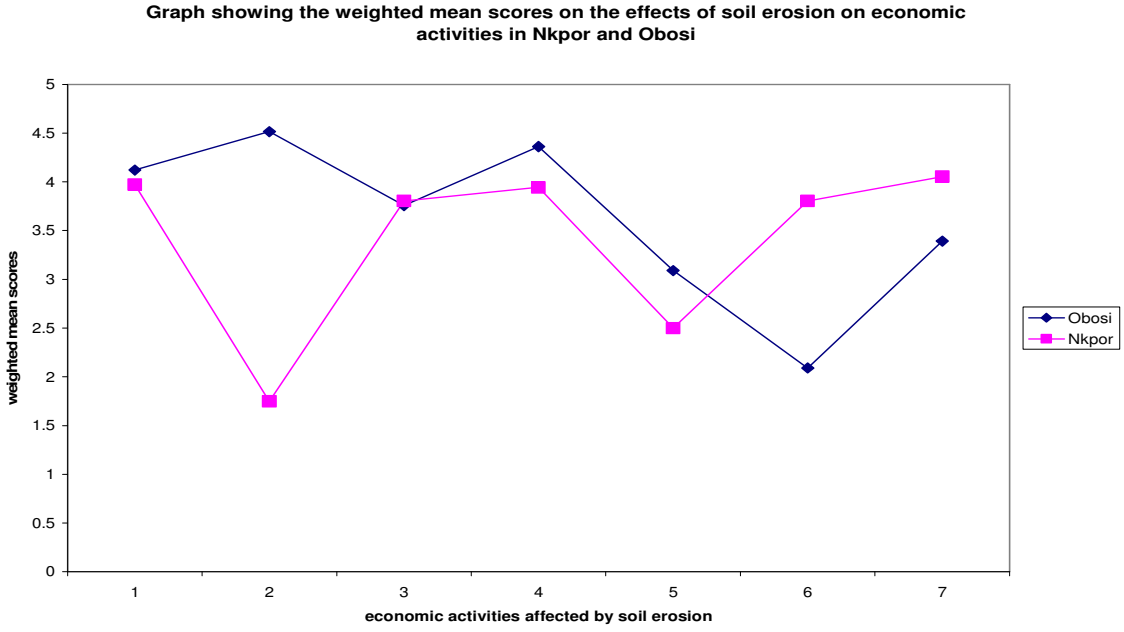

Fig. 4: Graph Showing the comparison of weighted mean score of economic impacts of soil erosion.

From the graph above, both communities were of comprehensive agreement that erosion has caused loss of

farmland, loss of income, loss of properties and destruction of social infrastructure. There is divergence opinion between the two communities on whether soil erosion has led to traffic congestion and psychological trauma. Majority of respondents on Obosi disagree on siltation of water while those in Nkpor were of positive opinion. Also, Obosi community agreed on loss of farm produce.

Table 9:

Descriptive Statistics for effects of erosion on economic activities in Nkpor and Obosi

	N	Sum	Mean		Std.	Variance
	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
econeffect1	138	558	4.04	.091	1.073	1.151
econeffect2	138	424	3.07	.131	1.541	2.374
econeffect3	138	522	3.78	.082	.965	.930
econeffect4	138	572	4.14	.079	.925	.855
econeffect5	138	384	2.78	.115	1.355	1.836
econeffect6	138	412	2.99	.119	1.393	1.941
econeffect7	138	516	3.74	.107	1.252	1.566
Valid N (listwise)	138					

The residents of both communities were of the opinion that erosion does not cause increase in the price of goods and services as can be seen from the table 4.12 below:

TEST OF HYPOTHESES

HYPOTHESIS ONE

H_0: There is no significant variation between the responses on the social activities affected by soil erosion in Nkpor and Obosi.

H_i was tested using the two samples T-test and confidence interval. This compared social activities affected by erosion in Nkpor and Obosi. The result is shown in Table 10 below:

Table 10: Two samples, T-Test and Confidence interval comparing social activities affected by erosion in Nkpor and Obosi.

Two sample T- test for Obosi vs Nkpor

N	Mean	StDev	SE Mean
Obosi 9	**3.532**	**0.715**	**0.24**
Nkpor 9	**3.351**	**0.937**	**0.31**

Source: Author's Field Work (2009)

95% CI for mu Obosi - mu Nkpor: (-0.66, 1.02)

T-Test mu Obosi = mu Nkpor (vs not =): T= 0.46 P=0.65 DF= 14

P value is equal to 0.65 degree of freedom 14. Since P is greater than 0.05. From the decision rule, we accept null hypotheses and thus infer that the responses on the social activities affected by soil erosion in Nkpor and Obosi. The proof of the result is verified from the table 11 below.

Table 11: Z-Test for effects of erosion on social activities in Obosi and Nkpor towns

Variable	N	Mean	StDev	SE Mean	Z	P
soceffec1	138	4.058	0.902	0.122	8.69	0.0000
soceffec2	138	3.551	1.285	0.122	4.52	0.0000
soceffec3	138	2.870	1.334	0.122	-1.07	0.28
soceffec4	138	2.348	1.118	0.122	-5.36	0.0000
soceffec5	138	3.159	1.319	0.122	1.31	0.19
soceffec6	138	3.957	1.059	0.122	7.86	0.0000
soceffec7	138	4.159	0.898	0.122	9.52	0.0000
soceffec8	138	3.986	1.060	0.122	8.10	0.0000
soceffec9	138	2.855	1.316	0.122	-1.19	0.23

Source: Author's Field Work (2009)

Test of mu = 3.000 vs mu not = 3.000

The assumed sigma = 1.43

From the above, it can be concluded hat both communities agreed that erosion has severely affected their social lives and well being. They were of the opinion that erosion has caused loss of lives, traffic congestion, poor health conditions, psychological trauma, and migration of people and displacement of families. This can be seen

from the mean scores of 4.0, 3.5, 3.15, 3.95, 4.1, 3.98 recorded respectively.

HYPOTHESES TWO

H_0: There is no significant variation between the responses on the economic activities by soil erosion in Nkpor and Obosi.

Hypotheses II was tested using the table 12, the two samples, T-test and confidence interval. This compared economic activities affected by erosion in Nkpor and Obosi.

Two sample T for Nkpor vs Obosi

N	Mean	StDev	SE Mean
Nkpor 7	3.406	0.906	0.34
Obosi 7	3.619	0.847	0.32

Source: Author's Field Work (2009)

95% CI for mu Nkpor - mu Obosi: (-1.24, 0.82)

T-Test mu Nkpor = mu Obosi (vs not =): T= -0.45 P=0.66 DF= 11

P value is equal to 0.66 degree of freedom since P is greater than 0.05 and from the decision rule, we accept null hypotheses; thus, concluding that three is no significant variation between the economic activities affect by erosion in Nkpor and Obosi.

Further proof of the result is verified from table 4.18 below.

Table 13: Z-Test for Effects of Erosion on Economic Activities in Nkpor and Obosi.

Test of mu = 3.000 vs mu not = 3.000

The assumed sigma = 1.43

Variable	N	Mean	StDev	SE Mean	Z	P
econeffe1	138	4.043	1.073	0.122	8.57	0.0000
econeffe2	138	3.072	1.541	0.122	0.60	0.55
econeffe3	138	3.783	0.965	0.122	6.43	0.0000
econeffe4	138	4.145	0.925	0.122	9.41	0.0000
econeffe5	138	2.783	1.355	0.122	-1.79	0.074
econeffe6	138	2.986	1.393	0.122	-0.12	0.91
econeffe7	138	3.739	1.252	0.122	6.07	0.0000

Source: Author's Field Work (2009)

From the above, majority of the respondents in both communities agreed that soil erosion has disrupted economic activities. They firmly agreed that erosion caused loss of farmland, loss of farm produce, loss of income, loss of properties and destruction of social infrastructure. This can be seen from the mean score of 4.04, 3.07, 3.78, 4.14 and 3.713 respectively.

DISCUSSION / SUMMARY OF FINDINGS

The problems owing from gully erosion as the years have gone by, have approached pandemic levels in towns like Nkpor, Obosi, Agulu, and Nanka etc. Egboka (1993) stated that gully erosion and landslides are terminal and cancerous ecological diseases that destroy within minutes and hours, land formed with natural nutrients over hundreds, thousands or millions of years ago. Soil erosion steadily removes thin layers of rich soils and sediments that can hardly be replaced thousands of years later, after a few millimeter's or centimeters of rainfall that must have occurred within some minutes.

One of the understated adverse impacts owing to soil erosion has been its effects on lakes, springs, rivers, marshlands, water schemes, roads, bridges. Researchers have explained that through soil transport caused by torrential rainfalls and subsequent floods, water bodies such as lakes, spring, rivers, reservoirs, are silted up with materials that are possibly hazardous.

The greater Onitsha water schemes have been seriously eroded by the advancing gully erosions in Nkpor. This also occurs at Idemili River in Obosi which is suffering from siltation and sedimentation. The effects of these have already started reverberating among the villagers who depend on this water for their household activities.

In terms of Agriculture, the adverse impacts are glaringly evident in most of the erosion prone communities. A reasonable population of the study area depends on agriculture for livelihood. However, rural farmers have witnessed their returns or harvest continuously dwindled. Those knowledgeable in the field attributed it to the sands transported by the storm-water and deposited on farmlands. This is prone to become heavily compromised to the level too poor to sustain gainful farming activities. This is as a result of wash out during water transport. As the sand particles are transported in volumes, that are normally very large. It is stripped in the process of its nutrients that sustain plant growth. The soil acidity which is detrimental to the plant growth increases thus seriously hindering productive agricultural activity. Also the housing needs of the people of Nkpor and Obosi have been adversely affected by the activities of soil erosion. Most houses along Agulu

Avenue in Nkpor have been lost to erosion. People have become refugees in their own towns; the implication are so many psychological and health problems such as frustration, restlessness, cardiac arrest / heart failure, high blood pressure, psychopathological disorder, insomnia and death.

Furthermore, landslides and other forms of erosion are very serious problem in these two Communities. After a heavy rainfall, often whole sections of a road rush down or are buried by soil masses. This leads to loss of transportation and communication. It causes traffic problems increase noise pollution in villages as transporters resorts to inland roads. Typical example is the loss of St. Mark's Anglican Church road, Obosi.

Soil erosion has also affected the social standards of the host communities. This has resulted in the increased social vices that have impacted adversely on some socio-cultural values of the community. Among these are youth restiveness, due to non availability of employment, which could have been made available from farming and these has increased the level of poverty in the area. Also, increase in the male-female enrollment in schools has been recorded due to poverty, loss of buildings and sources of livelihood.

The work looked at the socio-economic impacts of erosion in these areas by collecting information with the aid of questionnaires. It showed that erosion in these areas has affected communication between the residents, led to migration of residents, loss of farmlands, low farm income, destruction of roads, psychological trauma, loss of properties, increase in the prices of goods and services, poor health conditions and increase in crime rates.

In addition the study analyzed the data obtained in order to test the stated hypotheses. From the results, it was also observed that there were similarities in social and economic implications of soil erosion in Nkpor and Obosi.

CONCLUSION AND RECOMMENDATION

From the findings of the study, the following conclusions were drawn:

That soil erosion has impacted on both social and economic activities in Nkpor and Obosi in a number of ways including loss of lives, traffic congestion, impairment of relationships, poor health condition, psychological trauma, migration of people of, displacement of families, increase in crime rates, loss of farmlands, loss of income, loss of properties, increase in the prices of goods and services, siltation of water bodies, destruction of social infrastructure.

Based on the findings, the work recommended the following:

a. The government and research institutes need to have proper knowledge in chemistry and further studies should be geared towards finding chemicals that are capable of reacting with the soil to enhance cementation and lithification and reduce the erodibility and erosivity of the soil.

b. The nutrient level of the soil should be enriched to help in the growth of trees whose roots will help in the improvement of the organic content of the soil and reduce detachability due to rain drops and the effects of the winds.

c. The development of an integrated Environment Management Programme (IEMP) for the state based on the principles of sustainable development. This includes implementation of Environmental Impact Analysis (EIA) for every project in the state. This is to predict negative impact.

d. All Federal, State, Local government agencies must be made to change their planning, design, construction methods and techniques in gully erosion prone areas since their present methods are erosion causative and highly destructive.

e. An Environmental Management Institute and Erosion Research [EMIER] should be established to work out lasting solutions and strategies to combat the ecological problems on a continuous basis.

f. Erosion and Flood Control Programs and assignments must be worked out through involvement of people, individuals, communities and LGAs of the affected areas through people. Participation in projects such that people can take active part in gully erosion control projects. Therefore, a call is made to the government, law enforcement agencies and the public at large to join hands in combating this environmental problem in the state.

g. There should be massive constructions of catchment basins or Okwa Lakes, Sedimentation Basins, catchment pits, drainage channels etc at several locations in flood and erosion areas.

h. Soil and Gully Erosion Commission (SOGEC) that shall take care of erosion matters in Nigeria should be established and a special annual allocation or subvention of consolidation funds should be made and possibly budgeted for, the next ten years for SOGEC to handle erosion and flood problems; the first assignment of SOGEC shall be to put aside one day every year that shall be declared an erosion day for an annual appraisal of issues and problems of erosion nationwide.

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