



Nigerian Erosion Watershed Management Project and Sustainable Development in South-Eastern, Nigeria

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ABSTRACT

The potential impacts of the Nigerian Erosion Watershed Management Project (NEWMAP) to sustainable development of the South-eastern, Nigeria is highly considerable. Therefore, this study investigated the participation of the local communities in NEWMAP towards achieving sustainable (economic, social and environmental) development of Southeast, Nigeria. Using the community development, participation and empowerment theory as the underpinning theories, 30 hypotheses were developed to examine the effect of NEWMAP on sustainable development and moderating role of community participation between NEWMAP and sustainable development. A sample size of 384 respondents was selected from the entire study population of 12,990,485. Structured questionnaire was used to collect primary data from NEWMAP staff, government representatives, civil society organisations, traditional authorities, religious representatives and the youths of the communities through stratified sampling and snowball sampling technique. 233 usable responses were received and analysed using Smart PLS-SEM. The result indicated that 16 hypothesized relationships (both direct and moderating hypotheses) were supported. Specifically, the study found significant evidence to support that economic strand of sustainable development of the South-east, Nigeria was influenced by NEWMAP administration, communication and monitoring/evaluation. Social development of the region was significantly influenced by NEWMAP planning and identification, administration, communication and implementation while the environmental strand of sustainable development was significantly influenced by NEWMAP planning and identification, implementation/execution and Monitoring and evaluation. Hence, the important implications of this study to policy makers, academics and community project managers is to increase the involvement of community members in development projects to enhance the achievement of sustainable development in the host communities.

Key words: NEWMAP, Participation, Development project, Sustainable development, South east, Nigeria

1. INTRODUCTION

Many parts of Nigeria are prone to the threat of devastating gully erosion, which has become a common occurrence in many communities in the country. In previous years, it is common to see many families abandon their homes any time it rained because their homes lie within gully erosion sites that are about 100 feet deep in some cases [1]. Similar to other parts of the world, the formation of gullies has become one of the major challenges facing Nigeria [2-5], especially the South-eastern Nigeria [2, 5]. According to Onwuka (2008), erosion is the most severe of all the four (flood, desertification, drought and erosion) environmental hazards in Nigeria. It is very pronounced in almost every urban centres of the South-eastern Nigeria [6].

The effect of gully erosion in the south-eastern Nigeria is fast becoming hazardous for human habitation as hundreds of people are directly affected every year and have to be relocated [3,7]. The period between 1920 and the present has witnessed not only the disappearance of arable lands but also numerous loses of lives and properties due to gully erosion. Large areas of agricultural lands are becoming unsuitable for cultivation as erosion destroys farmlands and lowers agricultural productivity [8]. More than 1000 farmland sites were washed, thereby denying the people one of their main source of livelihood [1].

Furthermore, several properties whose value cannot be quantified accurately have been destroyed and others are under threat by this menace especially houses and other properties located on the floodplain. The NTA News on 6th July, 2013 reported that over 450 buildings were lost in Edo State of Nigeria as a result of erosion. More recently, many lives were

also lost to gully erosion in the south-east Nigeria [9]. About 23 people were reported to have lost their lives in a single event of gully erosion activities, while the homes of over 856 families located along the gully channels are being threatened as these channels continue to expand at alarming rate. The economic damage brought by gullies, mainly in Nigeria's southeast could be up to \$100million every year, with an agricultural yield losses of 30 – 90% in some areas [9]. Gully erosion contributes to environmental problems and cause damage estimated at over \$100 million annually in most parts of Nigeria [10]. This is a threat to the Federal Government of Nigeria's "Vision 2020" as it undermines the sustainable growth of the affected communities [10].

Community Development (CD) projects such as Nigerian Erosion Watershed Management Project (NEWMAP) have been actively promoted throughout the developing world as part of the state building process and as a means of raising living standard of the people by governments and Non-government organizations in Africa [11]. Since independence in Nigeria, rural and community development has been declared a priority by the successive Federal governments-civilian or military alike [12]. Mark [13], notes that Nigeria has had several community development programmes/projects implemented to address the issues of sustainable development but no any meaningful development was witnessed by communities in Nigeria. Galadima, [14] notes that, community development programme is one of the veritable tools for improving human conditions.

The severity of environmental degradation on the sustainable development of the southeast Nigeria prompted the government to seek urgent support from the World Bank to tackle the challenge in seven states on a pilot basis: Abia, Anambra, Cross River, Ebonyi, Edo, Enugu and Imo. The bank responded through the US\$500 million IDA-Financed Nigerian Erosion Watershed Management Project (NEWMAP) and has mobilized a strong coalition at national and international level to tackle and reduce the soil erosion on a war footing. The project became effective in September, 2013 and has received \$3.96 million from the Global Environmental Facility and \$4.63 million from the special Climate Change Fund (World Bank, 2013). The NEWMAP project is breaking new ground by mobilizing funding, technical assistance and local expertise including community engagement to tackle a pressing erosion and watershed problem in Nigeria.

2. MATERIALS AND METHODS

2.1 Study Area

The area of this study is the South East, Nigeria and comprises of the seven states within which NEWMAP project was piloted in Nigeria. These states comprises of Abia, Anambra, Cross Rivers, Ebonyi, Edo, Enugu and Imo. The South East of Nigeria is one of the six geopolitical zones in the country. The region consists of the following states that make up what is now unofficially known as the southeast region. The physiography and geological formation of the South eastern area shows that the area lies within the humid tropical rainforest belt of Nigeria with an annual rainfall of about 2000-3000mm, average temperature range of about 25 – 27.5 °C, and mean annual sunshine hours of about 1750hours. Relative humidity varies with season with an average value of about 75 – 95% and a mean annual atmospheric pressure of about 1101±1.2mbars [15].

2.2 Population of the Study

The population of this study includes the community members of the five states where NEWMAP project is being implemented in south-eastern Nigeria. These include: Abia, Anambra, Ebonyi, Enugu and Imo. The population of the study also include the employees of NEWMAP projects. The government representatives of each community, civil society organisations, traditional authorities and the youths are identified as the partners to community development and therefore identified as the participants of the study. Table 1 presents the distribution of the population of the study.

Table -1 Distribution of population of the study

S/N	State	Population	% > 18 Years	Population > 18 years
1	Abia	3,727,300	60.1	2,240,107.3
2	Anambra	5,527,800	60.5	3,344,319
4	Ebonyi	2,880,400	55	1,540,165
6	Enugu	4,411,100	59.9	2,642,248.9
7	Imo	5,408,800	59.6	3,223,644.8
Total		21,955,400		12,990,485

Source: National Population Commission of Nigeria (2019)

From Table 1 the projected population of the identified pilot state of NEMAP project in Nigeria indicates that total population of the states is 21.955,400 residents of the states. The however identified that only the respondents that have attained the age of 18 years are deemed fit to participate in community developmental project such as NEWMAP and these are totalled up to be 12,990,485 in these states of South-eastern Nigeria which represents the population of the study. The identified respondents of the study include the representative of the government which includes the state and local government, community representative including community leader, religious leader, youth leaders and community members, and the Non-governmental organisation in the communities where NEWMAP projects is being implemented.

2.3 Sample Size

A sample size of 384.2 was determined for the population of 12,990,485 using the formula provided by Dilman [16] and Weaver [17] as follows:

$$n = \frac{N(p)(1-p)}{(N-1)\left(\frac{B}{C}\right)^2 + (p)(1-p)} \quad (1)$$

N=population size, *P*=0.5, *B*=0.05,*C*=1.96

Where: *n* = calculated sample size required for the desired level of precision

N = size of the population,

P = the proportion of the population expected to be chosen

B = the acceptable amount of precision or sampling error

C = is the K value associated with the confidence level.

2.4 Sampling Technique

This technique for sampling in this study was conducted in multiple stages which involves both probabilistic and non-probabilistic approach. The first stage involves a stratified sampling technique which involves dividing the sample size into different strata (state) based on the proportional contribution of each state to the population. Table 2 presents the distribution of the sample size across each state in the study.

Table -2 Distribution of the sample size of the study

S/N	State	Population > 18 years	Proportion of sample	Sample Size
1	Abia	2,240,107.3	0.1724	66.2
2	Anambra	3,344,319	0.2574	98.86
4	Ebonyi	1,540,165	0.1186	45.52
6	Enugu	2,642,248.9	0.2034	78.11
7	Imo	3,223,644.8	0.2482	95.29
Total		12,990,485		384

The second stage of the sampling technique includes the combination of probabilistic technique (simple random technique) and non-probabilistic technique (snowball technique) within each state of the study. The snowball technique allows the researcher to identify the community religion and youth leaders in each community while the other members of the communities was selected for the study using the simple random sampling.

2.5 Data coding

Prior to data entering into the statistical tools in this study, data coding was embarked upon by the researcher. This was done in-line with the categorization provided data should be coded in-line with the constructs for easy identification and analysis. Hence, the items of the questionnaires were coded as shown in Table 3 below

Table -3 Data coding

Construct	Code
NEWMAP Project Planning & Identification	NPPI
NEWMAP Project Administration	NPA
NEWMAP Project Communication	NPC
NEWMAP Project Implementation & Execution	NPPIE
NEWMAP Project Monitoring & Evaluation	NPME
Community Participation	CP
Social Sustainability	SS
Economic Sustainability	ES
Environmental Sustainability	EVS

2.6 Data collection

This study regards survey questionnaire as an appropriate tool for data collection and was used to ensure that all the variables of this study are fully and accurately measured. Questionnaires are efficient method of data collection because of its ability to provide an efficient use of the time, energy and costs of the researcher [18]. Therefore, this research adopted a structured questionnaire consisting of closed-ended questions which was self-administered to the respondents. The choice of this data collection technique is to cover a wide geographic area and also provide physical interaction and assistance to the respondents in filling the questionnaire.

2.7 Data Analysis

The collected data was be analysed using both the descriptive and inferential statistics. The data analysis was conducted by using the smartPLS 2.0 M3 path modeling software. Prior to the main data analysis, a number of preliminary activities (data screening) was conducted by using SPSS version 23 to ascertain that the data collected are suitable for the inferential statistics.

2.8 Descriptive Statistics

The descriptive analysis was conducted to describe the phenomenon under consideration [18]. This was statistically explained the frequency of occurrence, average score, or central tendency (mean, median and mode) and the measure of dispersion (range, variance and standard deviation) of the phenomenon of interest NEWMAP project management, Sustainable development and community participation). The study applied descriptive analysis mainly to avail the sample characteristics and the characteristics peculiar to the constructs of the research.

3. RESULTS AND DISCUSSION

3.1 Response rate

A total number of three hundred and eighty-four (384) survey questionnaires were distributed to the study population out of which 261 respondents were obtained to have filled and returned the distributed questionnaires. However, as represented in Table 4, a total of 28 questionnaires were not included in the data analysis due to the issues related to missing values and outliers. The remaining 233 questionnaires were coded and used for the main data analysis.

Table -Error! No text of specified style in document. Response rate of the study

Item	Frequency	Percentage (%)
Distributed questionnaires	384	100.0
Returned	261	67.9%
Rejected questionnaires	28	7.3%
Retained questionnaires	233	60.6%

A total of 233 responses represent the sample size of the study which provided effective response rate of approximately 60.6% that covers the broad range of South-eastern states of Nigeria where NEWMAP is being implemented. This response rate is considered sufficient considering the suggestion of Hair *et al* [19] that a sample size should be ten times greater than the numbers of variables of the study. Given that the numbers of variables in this study in this study is 9, a sample size greater than 90 in this study is deemed adequate. Therefore, the response rate of 60.6% denoting 233 responses in this study is considered reasonable and used for the data analysis.

In this study, the respondents are categorised into two groups according to the time the responses were received. 136 of the questionnaires was classified as early response while 97 was regarded as late responses. Levene's test for equality of variance and descriptive test was done on the study variables for the comparison of standard error mean, standard deviation and mean between the early and late respondents. Table 5 shows the descriptive statistics of the non-response bias test. The result shows no statistical difference of the demographic variable. More so, Table 5 shows the independent t-test conducted to make comparison between early respondents and the late respondents. The result reveals that there are no significant differences between the two categories of the respondents.

Table -5 Descriptive statistics for early and late respondents

No		N	Mean	Std. Deviation	Std. Error Mean
Age	Early respondents	136	3.01	1.342	0.115
	Late respondents	97	3.04	1.306	0.133
Gender_1	Early respondents	136	1.62	0.460	0.039
	Late respondents	97	1.65	0.459	0.047
Qualification_1	Early respondents	136	2.45	1.184	0.102
	Late respondents	97	2.35	1.240	0.126
Occupation	Early respondents	136	2.56	1.275	0.109
	Late respondents	97	2.92	1.382	0.140
Position	Early respondents	136	3.58	1.314	0.113
	Late respondents	97	3.62	1.318	0.134
Exp_1	Early respondents	136	2.04	0.811	0.070
	Late respondents	97	2.02	0.661	0.067

3.3 NEWMAP Project Monitoring and Evaluation

The result of the descriptive analysis for NEWMAP project monitoring and valuation as shown in Table 6 reveal a minimum value of 1 and maximum value of 5 for all items of the constructs. The mean value ($m = 3.25$) for NPME2 and ($m = 3.39$) for NPME4 indicates that the respondents are neutral about regular meeting to monitor projects and NEWMAP progress being regularly compared with the project schedule. In addition, the mean value ($m = 3.53$) for NPME1, $m = 3.55$ for NPME3 and NPME5, and $m = 3.63$ for NPME6 indicate the agreement of the respondents to the statement that "all important aspects of NEWMAP projects are monitored", "The results of NEWMAP project reviews are regularly shared with the project personnels" and "Input is solicited from the project team when the project schedule requires review". The standard deviation value greater than 1.0 indicates that the responses are diverse opinion of the respondents.

Table -6 NEWMAP project monitoring and evaluation

S/N	Codes	N	Min	Max	Mean	Std. Dev
1	NPME1	232	1	5	3.53	1.306
2	NPME2	232	1	5	3.25	1.092
3	NPME3	232	1	5	3.55	1.112
4	NPME4	232	1	5	3.39	1.104
5	NPME5	232	1	5	3.55	1.014
6	NPME6	232	1	5	3.63	1.065
Mean	NPME	232	1.00	5.00	3.48	0.830

Note: 1-1.8 = Strongly Disagree; 1.81-2.6 = Disagree; 2.61-3.4 = Neutral; 3.41-4.2 = Agree; 4.21-5.0 = Strongly Agree

3.4 Community Participation

The result of the descriptive analysis of community participation as shown in Table 7 reveal a minimum value of 1 and a maximum value of 5 for all items of the constructs. The mean value for all the items indicates that the respondents are not sure of the statements for the constructs except for CP14 (m = 3.43) which indicates the agreement of the respondents to ‘‘Advocating for political support and financial resources’’. The mean value m = 3.57 for CP15 indicates that there is agreement of the respondents to ‘‘promoting better access to different foundations and expert resources’’ and also the mean value m = 3.51 for CP16 indicates the agreement of the respondents to ‘Improving participants ‘abilities to maintain and sustain political changes and achieve large social support’. However, the grand mean value (m = 3.27) of community participation indicates there the respondents are unsure of community participation in NEWMAP projects in the Southeast, Nigeria. The standard deviation values greater than 1.0 indicates that the responses are diverse across the respondents.

Table -7 Description of community participation

S/N	Codes	N	Min	Max	Mean	Std. Dev
1	CP1	232	1	5	3.00	1.304
2	CP2	232	1	5	3.33	1.142
3	CP3	232	1	5	3.05	1.249
4	CP4	232	1	5	3.09	1.235
5	CP5	232	1	5	3.27	1.161
6	CP6	232	1	5	3.33	1.278
7	CP7	232	1	5	3.28	1.235
8	CP8	232	1	5	3.37	1.166
9	CP9	232	1	5	3.27	1.227
10	CP10	232	1	5	3.33	1.212
11	CP11	232	1	5	3.23	1.179
12	CP12	232	1	5	3.32	1.280
13	CP13	232	1	5	3.09	1.348
14	CP14	232	1	5	3.43	1.156
15	CP15	232	1	5	3.57	1.114
16	CP16	232	1	5	3.51	1.162
Mean	CP	232	1.25	4.88	3.27	0.731

Note: 1-1.8 = Strongly Disagree; 1.81-2.6 = Disagree; 2.61-3.4 = Neutral; 3.41-4.2 = Agree; 4.21-5.0 = Strongly Agree

The predictive power of a particular model or construct and the determination of the standard path coefficient of each relationship between exogenous and endogenous variable in PLS analysis is assessed using the R squared (R²) values of the endogenous variables. The interpretation of the values of R² in PLS is similar to those obtained from multiple regression analysis. According to Chin [20] and Barclay *et al* [21], the value of the R² indicates the amount of variance in the construct explained by the model. Table 8 presents the R² result of this study model.

Table -8 R² result of the model

	R Square	R Square Adjusted
Economic Sustainability	0.3483	0.3309
Environmental Sustainability	0.1409	0.118
Social Sustainability	0.3821	0.3656

The R² result in this study indicates that the exogenous variables (NPPI, NPA, NPC, NPPIE & NPME) are able to contribute 34.8% variance in economic sustainability, 14.1% of the variance in environmental sustainability and 38.2% variance in social sustainability of the South-east, Nigeria.

3.5 Effect of NEWMAP on environmental development of South-East, Nigeria

The result of the path analysis in this study as revealed in Table 9 shows the result of the standard path coefficients (β), standard error, t-value and the decision in this study. In the same vein, the graphical presentation of the standard path

coefficients (β) and the t-value of the hypothesized relationships are presented in Figure 1. The result indicated that three (3) among the five hypothesized relationships have evidence of significant effects on environmental development of south-east Nigeria. The three significant hypotheses include: (1) NEWMAP implementation/execution (NPIE) and Environmental development (EVD) ($\beta = 0.291$; $t = 3.328$, $P < 0.05$); NEWMAP monitoring and evaluation (NPME) and Environmental development (EVD) ($\beta = 0.243$; $t = 2.145$, $P < 0.05$); and NEWMAP planning and identification (NPPI) and environmental development (EVD) ($\beta = 0.182$; $t = 2.223$, $P < 0.05$). However, the remaining relationship between NEWMAP administration (NPA), and communication (NPC) did not show any evidence of significant effect on environmental development (EVD).

The result of this study revealed a significant effect of NEWMAP planning and identification on environmental development of South-east, Nigeria. This implies that an increase in NEWMAP planning and identification will improve the development of the South-east, Nigeria. This finding corroborates the assertion of Shah *et al* [22] that the stage of environmental impact identification has been lacking in the holistic process of development projects in developing countries. Hence, identifying the environmental impact of developmental projects through planning and identification leads to sustainable development.

The result also revealed a significant effect of NEWMAP monitoring/evaluation on the environmental development of South-east, Nigeria. This implies that an increase in monitoring and evaluation of NEWMAP will improve environmental development of the South-East, Nigeria. This finding is in-line with the findings of Canter [23]; Aloni *et al* [24] who found project monitoring and evaluation as significantly influencing environmental development. According to Godwill [25], the essence of environmental monitoring is to ensure the actual impact of project on the environment does not negate the development activity that the project would have on the environment.

However, this study found that NEWMAP administration and communication do not influence environmental development in South-east, Nigeria. These findings contradict the results of Subbarano and Llyod [26] who found administration of public projects and communication of projects with relevant stakeholders as a determinant of sustainable developments in the host communities. One plausible explanation for the insignificant influence of NEWMAP administration on environmental development in this study is owned to the level of NEWMAP project administration within the host communities. The mean values of NEWMAP administration in this study shows that the respondents are not sure if every personal involved in NEWMAP projects understand their role, whether there is an adequate manpower for the project. Also, evaluation of the performance of the personnels of the projects are not known by the personnels. Hence, all this hamper the influence of NEWMAP administration on environmental development of South-east, Nigeria.

Table -9 Effect of NEWMAP on environmental development of South-east, Nigeria

Hypotheses	Path relationship	Beta (β)	Stand. Error	T Statistics	P Values	Decision
H _{3a}	NPA -> EVD	0.1153	0.0912	1.2652	0.2059	Not-Significant
H _{3b}	NPC -> EVD	-0.1258	0.0818	1.5365	0.1245	Not-Significant
H _{3c}	NPIE -> EVD	0.291	0.087	3.328	0.001	Significant
H _{3d}	NPME -> EVD	0.243	0.113	2.145	0.032	Significant
H _{3e}	NPP1 -> EVD	0.182	0.0818	2.2234	0.0262	Significant

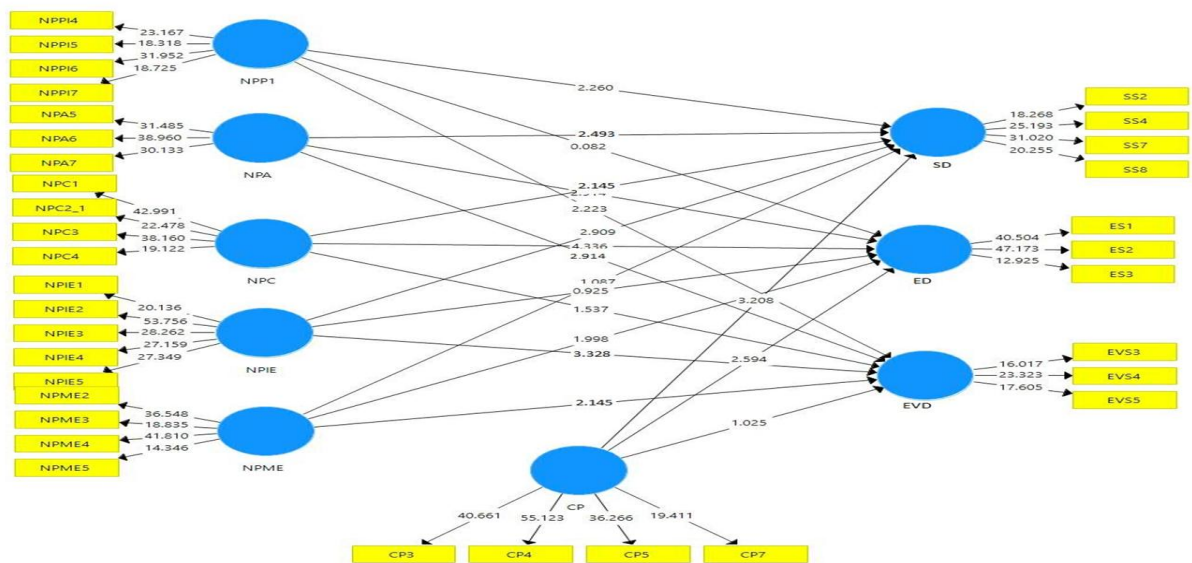


Fig. 1 Hypotheses result for direct effect

4. CONCLUSION

The study concluded that the community participation in NEWMAP ensured positive outcomes in term of the economic, social and environmental development of the affected South-east communities. The study promoted full awareness of NEWMAP and the involvement of the South-east communities at all stages of the projects. NEWMAP administration, communication and monitoring and evaluation significantly influence the economic development of the South-east, Nigeria. NEWMAP planning, administration, communication and implementation also significantly influence social development of the south-east communities while; NEWMAP planning, implementation and monitoring significantly influence environmental development of the beneficiary communities. The following recommendations are proposed in this study:

Monitoring of NEWMAP projects by government and donor agencies of should be continuous and should not be left entirely in the hands of community members. Rather, it should be a joint task between the government and the community members for effectiveness and achievement of the desired economic and environmental development of the region. This will enable both the government and beneficiaries of NEWMAP to easily overcome difficulties that could be encountered while utilizing the projects. It will help serve as a feed- back mechanism for the government and sponsor of NEWMAP.

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