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Assessing Infrastructural Development in Ogoniland in the Niger Delta Region of Nigeria: A Participatory Development Approach

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Abstract
Availability and access to basic infrastructure in rural areas across Nigeria has been identified by many as a crucial component for national economic development. The impacts of infrastructural facilities on quality of life and overall development cannot be underestimated. In light of the above, this paper assesses infrastructural development in Ogoniland through a participatory development approach. Using a multistage sampling method, four hundred households were surveyed in the community. The ordinal logic regression model indicates that infrastructural development in Ogoni community has been influenced by government interventions and oil companies through their corporate social responsibility programmes.
Keywords: Infrastructure Development, Government, Oil Companies, Land Degradation, Oil Spill

Introduction

In most developing economies, rural communities form the bedrock of economic development. This is because these rural communities provide most of the basic agricultural and non-agricultural products for economic development activities. Incidentally, these rural

communities have suffered neglect in terms of infrastructure development which has made them less attractive to live (World Bank, 1994).

It is against this background that this paper examines infrastructural development in Ogoni community (also known as Ogoniland) in the Niger Delta region of Nigeria. Apart from the need for an in-depth and intensive study, the choice of Ogoniland for this paper is based on the fact that the community was among the first places where oil was found in a commercial quantity in Nigeria – Shell began drilling in Ogoniland in 1958 (NEST, 1991 as cited in Ojide, 2015) .

Ogoni community consists of people of distinct indigenous minorities living in an area of 1,000 square kilometers on the south-eastern fringe of the Niger Delta Region of Nigeria. Given an average population growth rate of 2.50 (2007 – 2010) and a population figure of 831,726 as published by the National Bureau of Statistics (2206), the 2010 population of Ogoni people is estimated to be around 914,899 (SAro-Wiwa, 1995; UNPO, 2009; World Bank, 2010). Administratively, Ogoniland has four local government areas (LGAs). They are Eleme, Gokana, Khana, and Tai with populations of 209,972; 251,711; 323,639; and 129,577 respectively (Ojide & Ikpeze, 2015).

The concept of infrastructure has been viewed from different perspectives in recent times. In general, however, infrastructure refers to those basic services and structures without which primary, secondary, and tertiary productive activities cannot function. According to Khan (1979), rural infrastructural facilities can be classified into three main types. They are physical infrastructure (such as road, water, electricity, storage and processing facilities), social infrastructure (such as health and educational facilities, community centres, and security services), and institutional infrastructure (such as credit and financial institutions). This paper focuses on three aspects of physical infrastructure, namely: access road, potable water and electricity. FAO (2005) observed that rural infrastructure plays crucial role in poverty reduction and overall socioeconomic development of households in rural communities of most developing economies.

As an oil producing community, Ogoniland has been a rural area of interest to both the Nigerian government and the oil companies in terms of intervention programmes aimed at infrastructural development of the community. Many times, planning for such interventions follow the top-down approach, as against the bottom-up or participatory approach, without considering inputs or perceptions of knowledgeable local nationals. This paper, therefore, examines the intervention activities of government and oil companies aimed at improving infrastructure in Ogoni community. The study follows a 'participatory development' approach and for this purpose, we adopt the definition of participatory development concerned with people's perception of themselves and their challenges, interests and needs (UNDP, 2006; OECD, 1995; Ojide, 2015). One fundamental assumption we make is that if locals are sufficiently aware of infrastructure impacts in their environments, then they should effectively participate in infrastructural development in their communities. Thus, the null hypotheses tested in this paper are:

- H_0: Government interventions in Ogoniland do not have significant impact on basic infrastructure in Ogoniland

- H_0: Oil companies' interventions in Ogoniland do not have significant impact on basic infrastructure in Ogoniland

Methodology

The data used in this research was obtained during a household survey. A multistage sampling method was employed. Ogoni community was purposefully selected. A sample size was obtained for the community. Then, using a quota method, the sample size was proportionally distributed among the local government areas (LGAs). Enumeration areas were randomly selected in each LGA. Finally, households were randomly selected in the chosen enumeration areas within each LGA. Interview schedule was adopted as the survey instrument. The sampling units were households in Ogoni community. Using 2010 estimate, distribution of households in Ogoni community shows that Eleme had 45,397; Gokana had 54,422; Khana had 69,973; while Tia had 28,015 (National Bureau of Statistics, 2006; World Bank, 2010; Ojide & Ikpeze, 2015).

The sample size formula specified by Yamane (1967), was applied (see equation 1):

$$s = \frac{N}{1 + N(e^2)} \quad \text{.....1}$$

s = required sample size.

N = the population size.

e = the degree of accuracy expressed as a proportion (.05).

Using the above formula, 400 households were obtained to make up the sample size. This sample size was distributed in proportion to number of households in each local government area in Ogoniland. That is, 92 households, 110 households, 141 households and 57 households sampled from Eleme, Gokana, Khana and Tai respectively.

Structured interview schedule was predominately closed-ended questions to enhance response rate and easy merging of data from all the four local government areas. The questions were developed based on reviewed literature and preliminary interviews. Some multiple choice questions also allowed respondents to comment further where necessary. As a result of the sensitive nature of this survey, indigenes of Ogoni community were used as enumerators. They were trained on general techniques for successful questionnaire administration. In addition, they were given detailed review of each question – why the question is asked and the expected range of responses – including how to ask the question to avoid 'leading question' bias. Also, they were instructed to adequately explain to the respondents the purpose of the survey as to avoid, as much as possible, biased responses. The use of educated indigenes of Ogoni community enhanced communication and reduced security risks given the emotional and political nature of the subject of interest and the study area. The questions were asked by the enumerators who filled-in the responses into the interview schedule. This reduced the chances of misinterpreting the questions. The respondents in each of the selected households were the heads of the households or their representative (who must be a spouse or adult son/daughter, where an adult is a person not less than 18 years old).

Pilot Stage and Test of the Instrument

Research experts (including an indigene of Ogoni community) conducted the face and content validation of the interview schedule. The reliability of the instrument was determined during the pilot study of 30 households randomly selected in Tai local government area (which is one of the local government areas of the study). The interview instrument was administered to the 30 households. Their responses were tested using Split-half reliability index – coefficient alpha (Cronbach, 1951). In split-half technique, the coefficient alpha is calculated using equation 2 (Allen & Yen, 1979):

$$\alpha = \frac{N}{(N-1)[1-\frac{\sum Var(Y_i)}{Var(X)}]} \quad \text{.....2}$$

where N = number of items

$\sum Var(Y_i)$ = sum of item variances

Var(X) – composite variance

On the average, the research instrument achieved about 83% reliability.

Model Specification

The impacts of government and oil companies' interventions on basic infrastructure in Ogoniland were evaluated using ordinal logit model as stated in equation 3 (Brenton, 2010).

$$y^* = \sum \beta_k x_k + \varepsilon_k \text{.....3}$$

where y* is an unobserved, continuous, underlying tendency behind the observed ordinal response (rating). The X_k represent the independent variables, while the β_k represent the associated parameters. The error term (ε_k) captures stochastic (unobserved) variation. It is assumed to be distributed logistically.

Relating the unobserved y* to Y through a series of "cut points", is as represented in equation 4:

$$\left.\begin{array}{l} Y = 1 \text{ if } y^* \le \mu_1 \\ Y = 2 \text{ if } \mu_1 < y^* \le \mu_2 \\ \cdots \\ Y = j \text{ if } \mu_{j-1} < y^* \end{array}\right\} \text{.....4}$$

where Y is the rating and the μ's represent thresholds of y* that delineate the categories of the ordered response variable. These threshold parameters are restricted to be positive where each one is greater than the previous. The first parameter μ_1 is normalized to 0 so that one less parameter has to be estimated. That is not a problem because the scale of the latent variable is arbitrary (Borooah, 2001; Ojide & Ikpeze, 2015).

To avoid confusion and misinterpretation of estimates, Y is restricted to a five-point Likert item or less – measuring impacts of oil companies' interventions and government interventions on basic infrastructure in Ogoni community. Using equation 3, equation 5 was estimated. Variables are as defined in table 1.

$$\left.\begin{aligned} Road &= \mathrm{f}(GIrd, CSRrd, LD) \\ water &= \mathrm{f}(GIw, CSRw, OS, income) \\ Electricity &= \mathrm{f}(GIel, CS\,\mathrm{Re}l) \end{aligned}\right\} \ldots\ldots 5$$

Table 1: Definition of Variables

Variable Code	Description
Electricity	Electricity supply (very low=1, low=2, mild=3, high=4, very high=5)
LD	Land Degradation (very low=1, low=2, mild=3, high=4, very high=5)
OS	Oil Spillage (very low=1, low=2, mild=3, high=4, very high=5)
Road	Accessible roads (very low=1, low=2, mild=3, high=4, very high=5)
Water	Portable water (very low=1, low=2, mild=3, high=4, very high=5)
Income	Household income (18000 & Below=1, 18100 - 50000=2, 50100 - 100000=3, 100100 – 250000=4, > 250,000=5)
	CCGG to GIw below were coded as: low=1, average=2, high=3, very high=4
CSRel	Corporate Social Responsibility of oil firms towards supply of electricity
CSRrd	Corporate Social Responsibility of oil firms towards provision of accessible roads in the community
CSRw	Corporate Social Responsibility of oil firms towards provision of portable water
GIel	Government intervention towards supply of electricity
Gird	Government intervention towards provision of accessible roads in the community
GIw	Government intervention towards provision of portable water

Results and Discussion

Household survey was conducted in all the four local government areas (LGAs) in Ogoni community. The survey started in December 3, 2013 and ended in January 17, 2014. Complete responses from sample size of 400, as specified, were successfully collected.

Analyses of categories of respondents in all the four local government areas of Ogoni community (pooled data) indicate that greater proportion (54%) of the respondents was household head. The 46% non-household head respondents were wives (22.8%), sons (34.8%) and daughters (42.4).

Majority (81.5%) of the households surveyed were indigenes of Ogoniland while the rest were non-indigenes residing in Ogoni community up to the time of the survey (table 6). About 79.5% of the households had lived in the community beyond 10 years, 13.5% had lived in the community between 5 year to 10 years; and 7% had lived in the community for a time period below 5 years.

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Breakdown of literacy level of household heads reveals that only about 3.8% of the household heads in the community had no formal education. Majority of the household heads were literate with primary school (10.3%), secondary school (26.3%), national diploma (22.8) and first degree/post graduate degree (37%). The results of the estimated ordinal logit models are presented in table 2.
The three models estimated are presented in table 2.

Table 2: Ordinal Logistic Analysis of Economic Impact Models

	Road		**Water**		**Electricity**	
Variable Value	**1, 2, 3, 4, 5**		**1, 2, 3, 4, 5**		**1, 2, 3, 4, 5**	
Predictor	**Coef**	**Odds Ratio**	**Coef**	**Odds Ratio**	**Coef**	**Odds Ratio**
Const (1)	1.6447* {0.000}		0.6308 {0.074}		0.9807* {0.000}	
Const (2)	3.1997* {0.000}		2.0058* {0.000}		2.4207* {0.000}	
Const (3)	4.9785* {0.000}		3.7543* {0.000}		4.0203* {0.000}	
Const (4)	7.1824* {0.000}		5.9022* {0.000}		5.4006* {0.000}	
GIw			0.7424* {0.000}	0.48*		
GIel					0.9784* {0.000}	0.38*
Gird	0.9888* {0.000}	0.37*				
CSRw			0.4794* {0.002}	0.62*		
CSRel					0.4612* {0.000}	0.63*
CSRrd	-0.3913* {0.001}	0.68*				
OS			0.0885 {0.255}	1.09		
LD	-0.15383 {0.062}	0.86				
Income			0.08895 {0.225}	1.09		
Test that all slopes are zero (G)	139.920* {0.000}		61.152* {0.000}		163.437* {0.000}	
Goodness-of-Fit Test (χ^2)	280.986* {0.004}		614.573* {0.000}		131.546* {0.000}	

Cases used	384 (96%)	382 (95.5%)	383 (95.75%)
Cases with missing values	16 (4%)	18 (4.5%)	17 (4.25%)

A. Impact on Road

i. **Overall Model**

In this model, 96 percent of the observations were used while the rest were excluded due to missing values. The goodness-of-fit test, Chi-square (χ^2 = 280.986**)** with p-value (0.004), indicates that the model is appropriate for the data. Similarly, the overall relationship between the independent variables and the dependent variable is significant. This is because the statistic G (139.92), with p-value of 0.000, indicates that there is sufficient evidence to conclude that at least one of the estimated coefficients in the model is different from zero. Thus, the independent variables are simultaneously significant.

The model examined three factors namely government intervention towards provision of accessible roads (GIrd), corporate social responsibility of oil firms towards provision of accessible roads (CSRrd) and land degradation (LD). The p-values of the predictors indicate that for 0.05 alpha-level, there is sufficient evidence to conclude that Ogoni people's perceptions about government intervention towards provision of accessible roads (GIrd) and corporate social responsibility of oil firms towards provision of accessible roads (CSRrd) are statistically significant. However, unlike government intervention towards provision of accessible roads, corporate social responsibility of oil firms towards provision of accessible roads (CSRrd) is negatively associated with availability of access road in the community. On the other hand, the result indicates that land degradation (LD) is not a significant factor affecting access road in the community. In general, therefore, the null hypotheses about government and oil companies' interventions were rejected. However, while concluding that government intervention has positive impact on availability of accessible roads, it is observed that people of Ogoni community perceive oil company activities to have adverse effect on access roads in the community.

ii. **Cumulative Predicted Probabilities for each Score Category and Probabilities for the Individual Scores of the Dependent Variable at the means of the Independent Variables**

Keeping the estimated parameters fixed (that is $\beta = 0$), the cumulative predicted probabilities for each of the five categories and probabilities for the individual scores of access road in the community were calculated (table 3).

Table 3: Cumulative Predicted Probabilities of Availability of Access Road

Predictor	Coeff	Score	Cum Prob (score)	Prob (individual score)
Const (1)	1.6447	1	0.838173	0.838173
Const (2)	3.1997	1 or 2	0.960823	0.12265
Const (3)	4.9785	1 or 2 or 3	0.993163	0.03234
	7.1824	1 or 2 or 3 or 4	0.999241	0.006078
Cumulative scores (5)		1 or 2 or 3 or 4 or 5	1	0.000759

Table 3 indicates that Ogoni community has greater probability (0.838173) of being at the lowest category in terms of availability of access road in the community. The regression result suggests that land degradation is not a significant contributor to such low category of access road. The analysis suggests that Ogoni people's perception is that oil firms' activities have adversely affected availability of accessible road in the community. This is unlike government intervention towards provision of accessible roads (GIrd) which shows positive impact on availability of accessible road in the community.

B. Impact on Potable Water

i. **Overall Model**

In this model, 95.5 percent of the observations were used while the rest were excluded due to missing values. The goodness-of-fit test, Chi-square (χ^2 = 614.573**)** with p-value (0.000), indicates that the model is appropriate for the data. Similarly, the overall relationship between the independent variables and the dependent variable is significant. This is because the statistic G (61.152), with p-value of 0.000, indicates that there is sufficient evidence to conclude that at least one of the estimated coefficients in the model is different from zero. Thus, the independent variables are simultaneously significant.

The model examined four factors namely government intervention towards provision of potable water (GIw), corporate social responsibility of oil firms towards provision of potable water (CSRw), oil spill (OS) and household income. The p-values of the predictors indicate that for 0.05 alpha-level, there is sufficient evidence to conclude that government intervention towards provision of potable water (GIw) and corporate social responsibility of oil firms towards provision of potable water (CSRw) are statistically significant. Both variables are positively associated with availability of potable water in the community. On the other hand, the result indicates that oil spill (OS) and household income are not significant factors affecting availability of potable water in the community. Therefore, the null hypotheses about government and oil companies' interventions were rejected with the

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conclusion that government and oil companies' interventions towards provision of potable water in Ogoni community have positive and significant impact on effect on availability of potable water in the community.

ii. **Cumulative Predicted Probabilities for each Score Category and Probabilities for the Individual Scores of the Dependent Variable at the means of the Independent Variables**

Keeping the estimated parameters fixed (that is β = 0), the cumulative predicted probabilities for each of the five categories and probabilities for the individual scores of potable water in the community were calculated (table 4).

Table 4: Cumulative Predicted Probabilities of availability of potable water

Predictor	Coeff	Score	Cum Prob (score)	Prob (individual score)
Const (1)	0.6308	1	0.652671	0.652671
Const (2)	2.0058	1 or 2	0.881405	0.229734
Const (3)	3.7543	1 or 2 or 3	0.977119	0.095714
Const (4)	5.9022	1 or 2 or 3 or 4	0.997274	0.020155
Cumulative scores (5)		1 or 2 or 3 or 4 or 5	1	0.002726

Table 4 indicates that Ogoni community has greater probability (0.652671) of being at the lowest category in terms of availability of potable water in the community. The regression result, however, suggests that oil spill is not a significant contributor to such low category of availability of potable water in the community. On the other hand, the analysis result suggests that government (GIw) and corporate social responsibility of oil firms towards provision of potable water (CSRw) have contributed significantly to availability of potable water in the community.

C. Impact on Electricity

i. **Overall Model**

In this model, 95.7 percent of the observations were used while the rest were excluded due to missing values. The goodness-of-fit test, Chi-square (χ^2 = 131.546**)** with p-value (0.000), indicates that the model is appropriate for the data. Similarly, the overall relationship between the independent variables and the dependent variable is significant. This is because the statistic G (163.437), with p-value of 0.000, indicates that there is sufficient evidence to conclude that at least one of the estimated coefficients in the model is different from zero. Thus, the independent variables are simultaneously significant.

The model examined two factors namely government intervention towards provision of electricity (GIel) and corporate social responsibility of oil firms towards provision of

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electricity (CSRel). The p-values of the predictors indicate that for 0.05 alpha-level, there is sufficient evidence to suggest that government intervention towards provision of electricity (GIel) and corporate social responsibility of oil firms towards provision of electricity (CSRel) are statistically significant. Both variables are positively associated with availability of electricity in the community. Therefore, the null hypotheses about government and oil companies' interventions were rejected with the conclusion that government and oil companies' interventions towards provision of electricity in Ogoni community have positive and significant impact on efficient electricity supply in the community.

ii. **Cumulative Predicted Probabilities for each Score Category and Probabilities for the Individual Scores of the Dependent Variable at the means of the Independent Variables**

Keeping the estimated parameters fixed (that is β = 0), the cumulative predicted probabilities for each of the five categories and probabilities for the individual scores of electricity in the community were calculated (table 5).

Table 5: Cumulative Predicted Probabilities of availability of electricity

Predictor	Coeff	Score	Cum Prob (score)	Prob (individual score)
Const (1)	0.9807	1	0.727247	0.727247
Const (2)	2.4207	1 or 2	0.918392	0.191145
Const (3)	4.0203	1 or 2 or 3	0.982369	0.063977
Const (4)	5.4006	1 or 2 or 3 or 4	0.995506	0.013138
Cumulative scores (5)		1 or 2 or 3 or 4 or 5	1	0.004494

Table 5 indicates that Ogoni community has greater probability (0.727247) of being at the lowest category in terms of availability of electricity in the community. The regression result suggests that government intervention towards provision of electricity (GIel) and corporate social responsibility of oil firms towards provision of electricity (CSRel) have contributed positively to level of availability of electricity supply in the community.

Conclusion

Infrastructural development can be influenced by government intervention and corporate organizations through their corporate social responsibility programmes. Following the perception of Ogoni people, this paper concludes that availability of potable water and electricity supply in the community are significantly and positively influenced by government

interventions and by the corporate social responsibility functions of oil firms. Government intervention also positively impacts the availability of accessible roads in the community.
Given their high literacy levels and the correlations of these with impact perceptions, household heads prove that they can contribute meaningfully to infrastructural development planning in their communities. Therefore, developmental and multilateral agencies willing to improve infrastructure outlook in Ogoniland should consider engaging the household heads during the formation of such development programmes to ascertain community priorities.

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