

Evaluation of the Effectiveness of Adaptation Strategies to the Adverse Effects of Oil and Gas Exploration and Exploitation in Delta State

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Abstract

This study evaluates the effectiveness of adaptation strategies to the adverse effects of Oil and Gas exploration and exploitation in Delta State, Nigeria. Data from Focus Group Discussions (FGDs), Key Informant Survey (KIS) were collected and analyzed. 400 questionnaires were used for the study. The results reveal severe consequences on the environment; the inhabitants developed certain adaptation strategies, though ineffective compared to international best practices, to adapt to the continued and poorly monitored oil and gas exploration and exploitation. The adaptation capacities of the communities were analyzed based on five livelihood assets. The mean adaptation capacity index revealed that Sapelle Urban V has high mean coping capacity of (3.6), moderate coping capacity is recorded in Sapelle Urban II (3.49), Jerem II (2.59), Ozoro II (3.1), Koko II (3.29) and Ogheye (3.14) wards, while Ase (2.17), Okpai (2.25), Oghara (2.22), Jesse I (2.10) and Ewu II (2.29) wards, low coping capacity and are likely to be the most affected wards in terms of adaptation capacity. The study recommends the need for government's commitment in giving education the attention it deserves in order to empower people with the appropriate capacity to adapt to the ever increasing social and environmental changes, government to adequately provide infrastructural facilities in the oil producing communities; the need for the inhabitants to be economically empowered, in the form of poverty alleviation will go a long way to enable the people to adapt economically thus having the necessary wealth to be sustainable economically.

Keywords: Evaluation, Adaptation, Effects, Oil and Gas

INTRODUCTION

Oil and gas exploration and exploitation are making a variety of very useful contributions to the Nigerian economy, especially in the provision of revenues and foreign exchange. But when we move from the immediately apparent to the long lasting impact-from the largely monetary contribution to the real economic impact, a completely different picture emerges which show that, notwithstanding the massive increase in oil wealth, the industry is yet to

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make a significant impact on economic development in Nigeria. As a recent World Bank report on Nigeria commented, "At present, petroleum remains a typical enclave industry whose contribution to the [Nigerian] economy is limited largely to its contribution to government revenue and foreign exchange earnings" (Nwilo & Badejo, 2005b).

Adaptation to environmental changes has the potential to considerably lessen quite a number of the adverse impacts, moderate vulnerabilities and enhances sustainable development through improving the well-being of the underprivileged members of society. Consistent with the foregoing, Smit & Olga (2001) highlighted that adaptation to environmental changes is crucial as it allows farmers to offset the anticipated negative impacts. Furthermore, Bryan *et al.* (2009) reiterated that adaptation can protect the livelihoods of poor farmers and ensure food security. The broad use of the term 'coping' is sometimes equated with 'adaptation'. The expressions "coping" and "adaptation" are frequently used interchangeably to reflect techniques for adjustments to environmental conditions. Anderson *et al.* (2010) remarked that coping strategies may become adaptive strategies when people are forced to use them over a run of bad years and across seasons rather than just at the worst time of the year. And with adaptations, new coping range is established (O'Brien *et al.* 2012). Petroleum originates from two Latin words: 'petra' meaning rock, and 'elaion' meaning oil. Hydrocarbons refer to chemical substances formed exclusively from carbon and hydrogen. Petroleum hydrocarbons are thus naturally occurring hydrocarbon substances and, depending on the length of the carbon chain, can occur in gas, liquid or solid form. Hydrocarbons are formed by the decay of organic substances trapped within sedimentary rocks. High temperatures and pressure convert the trapped matter into hydrocarbons. Liquid hydrocarbon found in nature is also referred to as crude oil (UBS, 2004). Crude oil production includes the entire activities involved in the exploration and exploitation of crude oil. It encompasses the whole businesses engage in the two basic segments of petroleum industry - upstream, the prospecting and production activities related to crude oil and gas - downstream, all petroleum activities from the processing of crude oil into petroleum products, to the distribution, marketing, and shipping of the products (Nigerian Extractive Industry Transparency Initiative (NEITI), 2010). This present research therefore aims at proffering answers to this important question: What are the adaptation strategies of the inhabitants in mitigating the adverse effects of oil and gas exploration and exploitation, and the effectiveness in Delta State?

METHODOLOGY

Study Area

Delta State covers a landmass of about 18,050km² of which more than 60% is land. The state lies approximately between longitude 5°00 and 6° 45' East and latitude 5°00 and 6° 30' North (Figure 1). It is bounded in the North and West by Edo State, the East by Anambra, Imo, and Rivers States, South -East by Bayelsa State, and on the Southern Bank is the Bight of Benin which covers about 160 kilometres of the state's coastline (Delta State, 2010).

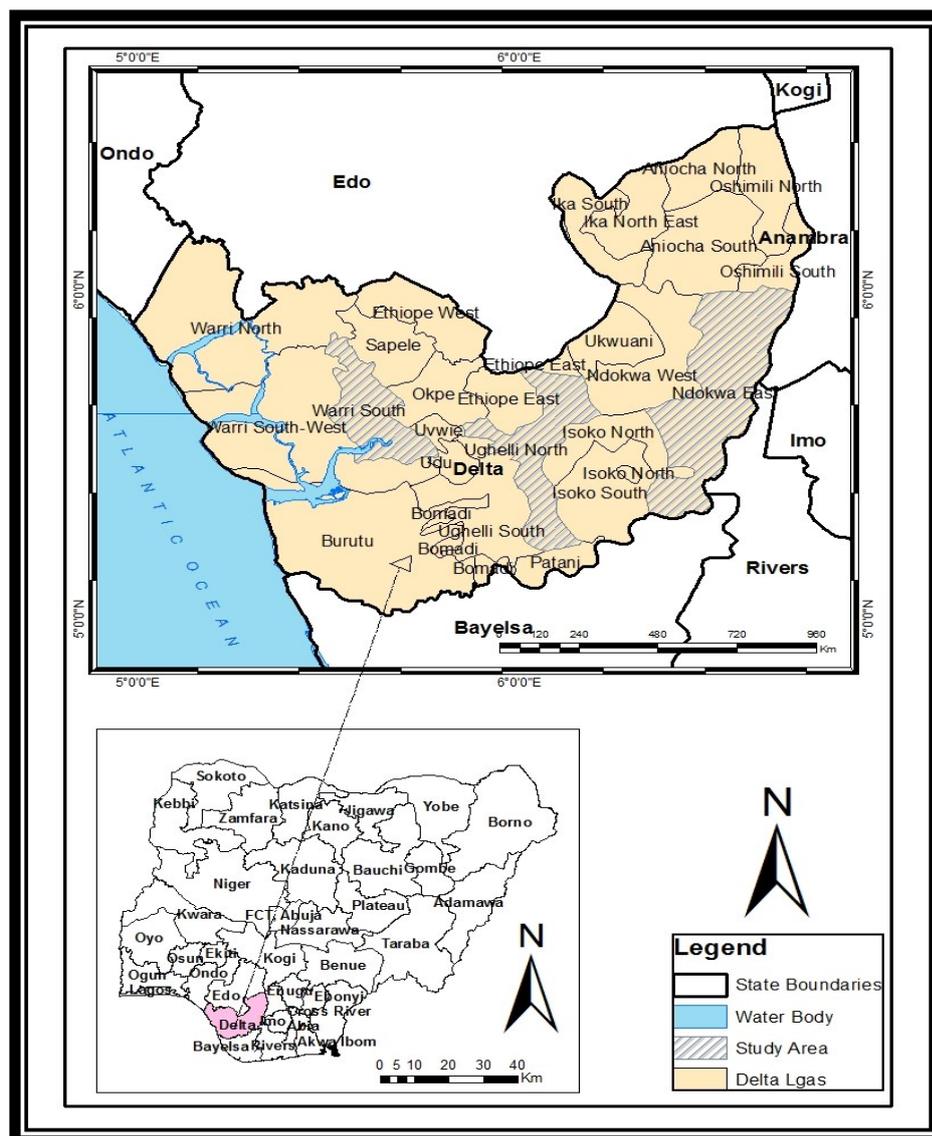


Figure 1: Delta State showing the Study Area
 Source: Adapted and modified from the administrative map of Delta State

Data Collection

Both primary and secondary data were collected through a combination of quantitative and qualitative methods of data collection. Surveys were employed in this study in form of questionnaire, Focus Group Discussions (FGDs), Key Informant Survey (KIS) and field observations formed the primary sources of information for this work. The 1991 Census was used for this study because the census was based on locality unlike the 2006 population census' document that has no locality population. The study area (Delta State) during the 1991 census had a population of 2,570,491 with an annual growth rate of 3.00% (National Population Commission, 1991). This figure was projected to year 2015. The population of the sampled LGAs, wards and communities were also projected to the year 2015. Systematic sampling technique was used in selecting Local Government Areas and wards while purposive sampling technique was used to determine the actual settlements from which respondents were drawn. Households were employed as entities of observation. Similarly, Yamane (1967) provides a simplified formula (equation 1) to calculate sample size with 95% confidence level and 5% sampling error assumption:

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

Where:

n= Sample size

N= Population

e= Level of significance (set at 0.05 for the study)

Using the above model, a sample size of 400 respondents was arrived at. Thus, 400 questionnaires were administered while 388 questionnaires were retrieved and used for the study. In order to determine the proportion of the respondents, Yamane (1967) sampling method for determining proportion of the respondents was used i.e.

$$\text{Sample size per ward} = \frac{\text{Ward Population} \times \text{Sample Size}}{\text{Total Wards Population}}$$

DATA ANALYSIS

In this study, the major indices influencing the people’s coping capacity were considered as employed by Deressa, *et al* (2008b) and Gbetibouo *et al* (2010). These five coping capacity depend on five livelihood assets: wealth, farmlands and farm inputs, availability of infrastructure and institutions, potential for alternative employment opportunity and literacy level. A five point LS was used (5=strongly agree, 4=agree, 3=undecided, 2=disagree and 1=strongly disagree) to assess the coping capacity to the effects of crude oil production. The method of determining coping strategies fit the parameters required for coping capacity study of this nature and has been effectively adopted in coping strategies studies. The coping capacity (CC) of each ward was therefore calculated as:

$$CC = \frac{W + FFI + AII + PAEO + LL}{5}$$

Where: W = Wealth

FI = Farmlands and Farm Inputs

All = Availability of Infrastructure and Institutions

PAEO = Potential for Alternative Employment Opportunity

LL = Literacy Level

CC = Coping Capacity

Table 1: Classification of Adaptation Capacity

Mean Score	Level of Adaptation Capacity
0.00 - 2.49	Low adaptation capacity
2.50 - 3.49	Moderate adaptation capacity
3.50 - 5.00	High adaptation capacity

Source: Abaji 2016:

RESULTS AND DISCUSSIONS

The activities of Oil and gas industry are associated with numerous adverse impacts on the people in the study area. For the continued survival of the inhabitants in the ecologically affected environment, which in turn affects their means of survival, there is the need for the people to adapt and adopt some coping measures with a view to be sustainable in their environment. The results of the analysis of the people’s adaptation capacity are shown in Table 2.

Table 2: Adaptation Capacity to the Impacts of Oil and Gas Exploration and Exploitation

WARDS													
Statement	Ase	Okpai	Oghara II	Jesse I	Sapele Urban IIIII	Sapele Urban V	Ewu II	Jeremi III	Iyede I	Otobio	Ozoro II	Koko II	Ogheye
Wealth consideration as indices of coping capacity to effects of crude oil production	2.27	2.28	2.48	2.09	3.58	3.66	2.24	2.56	3.67	2.24	3.59	3.5	3.56
Farmlands and farm inputs availability as indices of coping capacity to effects of crude oil production	2.42	2.33	2.32	2.01	2.27	3.68	2.26	3.18	3.16	2.93	2.36	2.12	2.44
Infrastructural and institutional availability as indices of coping capacity to effects of crude oil production	2.26	2.28	2.14	2.08	3.87	4.16	2.77	2.46	2.74	2.51	3.60	3.56	3.52
Potential for better alternative employment opportunities as indices of coping capacity to effects of crude oil production	1.78	2.36	2.12	2.00	3.55	3.01	2.00	2.19	2.40	2.62	2.28	3.67	3.2
Literacy level consideration as indices of coping capacity to effects of crude oil production	2.11	2.00	2.03	2.33	4.18	3.56	2.16	2.56	2.58	2.14	3.67	3.59	3.00
Mean	2.17	2.25	2.22	2.10	3.49	3.6	2.29	2.59	2.91	2.49	3.1	3.29	3.14
Rank	13	10	11	12	2	1	9	7	6	8	5	3	4

Note: 0.00 – 2.49 = Low Adaptation Capacity

2.50 - 3.49 = Moderate Adaptation Capacity

3.50 - 5.00 = High Adaptation Capacity

Source: Field Survey, 2016.

The results on wealth consideration as indices of adaptation capacity to the effects of oil and gas exploration and exploitation (Table 2) revealed high adaptation capacity among the communities in Iyede (3.67). Sapele Urban V (3.66), Sapele Urban II (3.58) moderate adaptation capacity among the communities in Jeremi III Ozoro II, Koko II and Ogheye wards with adaptation capacity indices, and low adaptation capacity among the remaining communities (Table 2). In terms of farmland and farm inputs consideration as indices of adaptation capacity to the effects of oil and gas exploration and exploitation, the results (Table

2) revealed that Sapele Urban V recorded high adaptation capacity (3.68) among all the communities. Moderate adaptation capacity was recorded among the people of Sapele urban II, Jereme II, Iyede I and Otobio wards and low adaptation capacity in other communities. In terms of infrastructural and institutional availability as indices of adaptation capacity, the results (Table 2) shows that Sapele Urban II, Sapele Urban V, Ozoro II, Koko II and Ogheye with adaptation capacity index of 3.87, 4.16, 3.6, 3.56 and 3.52 respectively have high adaptation capacity among the communities. Moderate adaptation capacity was recorded among Ewu II, Iyede I, and Otobio with adaptation capacity index of 2.77, 2.74 and 2.51 respectively. Potential for better alternative employment opportunity among the people is considered high in Sapelle Urban II (3.55), Koko II (3.65), Ogheye (3.6), (3.55) in Sapele Urban II, high (3.67) in Koko II, high (3.67) in Ogheye, Moderate (3.01) in Sapelle Urban V and also moderate (2.62) in Otobio wards, whereas this same variable is considered low in the other communities. Literacy level as an adaptation capacity among the people in the study area was considered high in Sapele Urban U, Sapelle Urban V, Ozoro II and Koko II with adaptation capacity index of 4.18, 3.56, 3.67 and 3.59 respectively; whereas, it was considered moderate among the communities of Jereme III, Iyede I, and Ogheye with adaptation capacity index of 2.56, 2.58 and 30.0 respectively. However, the coping capacity index of literacy level was low in the remaining communities. The availability of farmlands and access to agricultural inputs recorded moderate adaptation capacity among the rural people of Sapelle Urban V, Jeremi II, Iyede and Otobio wards. For examples, the use of pest and diseases resistant seeds, the use of early maturing varieties of crops, and accessibility to complementary inputs such as fertilizers, herbicides and pesticides in those wards will contribute positively to their successful coping measures.

According to Gbetibouo *et al*, (2010) access to farm inputs (or agricultural) provides a general picture of the financial status of a household or community. Ase, Okpai, Oghara II, Jesse I, Sapelle II, Ewu, Ozoro II, Koko II and Ogheye with low capacities in terms of availability and access to farmlands and agricultural inputs will be worst hit. The quality and availability of infrastructure and institutions in the study area is an important measure of adaptation capacity of a given community. Therefore, communities having well developed and organized infrastructures and institutions are considered to be better able to cope with the adverse effects of oil and gas exploration and exploitation than those with less effective infrastructure and institutional arrangements. This scenario which is common in communities Sapelle urban II, Sapelle Urban V, Ozoro II, and Ogheye wards contributed to the high coping capacity of the communities. Rural people living in marginal environments and areas with low or without infrastructure and or institutions are those with low adaptation capacity to the adverse effects of oil and gas exploration and exploitation. Based on potential for better alternative employment opportunities, communities in Sapelle Urban II, Sapelle Urban V, Koko II and Ogheye with high coping capacities are more likely to adapt to the adverse effects of oil and gas exploration and exploitation than those in Ase, Okpai, Oghara II, Jesse I, Ewu II, Jereme III, Iyede I and Ozoro II with low adaptation capacity. The high adaptation capacity of Sapelle Urban II, Sapelle Urban V, Koko II and Ogheye wards may not be unconnected with the fact that Sapelle Urban II and Sapelle Urban V belong to Sapelle Local Government Area while Koko II and Ogheye belong to Warri North Local Government Area; both of these local government areas are characterized with high level industrialization due to the presence of many industries which paves way for potential for better alternative employment opportunities in these areas. In terms of literacy rate, the assumption is that higher literacy levels increase adaptation capacity by increasing people's capabilities and access to information, thereby enhancing their ability to cope with adversities (Ikporukpo, 1988 and Abaje, 2016). Based on this assumption, Sapele Urban II, Sapele Urban V, Ozoro II and Koko II with high literacy rate are therefore considered to have high adaptation capacity to the adverse effects of oil and gas exploration and exploitation on livelihoods and

environment than other areas with low literacy rate. Lower education according to Cutter *et al.*, (2003) and Abaje, (2016) constrains the ability to understand warning information and access to recovery information.

Table 3: Adaptation Strategies to the Adverse Effects of Oil and Gas Exploration and

Statement	Asse	Okpai	Oghara II	Jesse I	Sapele Urban II	Sapele Urban V	Ewu II	Jeremi III	Iyede I	Otobio	Ozoro II	Koko II	Ogheye	Average	Rank
Praying for God's intervention	4.12	4.04	4.00	3.02	3.04	3.16	2.17	3.31	3.23	3.42	3.89	3.97	3.17	3.2*	3
Engaging in business in order to augment cost of crop production	4.32	3.24	3.66	3.72	3.38	3.55	3.11	3.79	3.42	3.66	3.72	3.00	3.88	3.57*	1
You have been educate on how to use modern storage facilities	2.00	2.14	2.32	3.11	2.42	2.66	2.59	3.00	2.88	2.77	3.16	3.17	3.46	2.74	5
Involvement in community and individual level savings	3.04	2.46	3.16	2.34	2.13	2.64	2.98	2.72	3.16	1.89	2.29	1.98	1.76	2.48	6
Planting of economic trees to generate income	3.48	3.56	3.84	3.92	2.98	2.76	3.78	3.98	3.69	3.49	3.00	2.68	2.80	3.09*	4
Attending enlightenment programs on coping with effects of crude oil production	2.34	2.04	2.68	3.16	2.16	2.82	2.76	2.61	2.44	2.96	2.84	2.32	2.11	2.39	7
Access to formal and credit community-based loaning institutions in your community	2.12	1.88	1.67	2.41	2.11	1.96	1.76	1.82	1.91	2.00	2.18	2.62	2.46	2.06	8
Seeking redress in court against oil companies	3.4	3.32	3.46	3.44	3.17	3.13	3.22	3.48	3.22	3.16	3.12	3.16	3.32	3.28*	2

Exploitation

*Significant Adaptation strategies

Source: Field Survey 2016

Adaptation strategies are determined according to the types and levels of impacts of oil and gas exploration and exploitation on the study area. Table 3 shows the coping strategies adopted by the people. The most significant adaptation strategies adopted by the communities of the study area was engaging in business in order to augment cost of crop production ($\bar{x}=3.57$) and communities seeking redress in court against oil companies ($\bar{x}=3.28$). These two adaptation strategies are found to be significant across all the wards in the study area. These are followed by praying for God's intervention ($\bar{x}=3.2$) in which all the wards were significant with the only exception of Ewu II ward. Planting of economic trees on available farmlands to generate income was the other significant adaptation strategy adopted by the communities in the study area. All the significant cases were in agreement with the results obtained by Akpobrie *et al.* (2000) and Udeh (2014) in various researches that dealt with rural communities survival strategies.

CONCLUSION

The variables implicated to influence coping capacity of the people included wealth, the availability of farmlands and access to agricultural inputs, the quality and availability of infrastructure and institutions, the availability of health services, potential for better alternative employment opportunities and literacy rate. Hence, the inhabitants have evolved various methods of ameliorating the adverse effects of crude oil production anomalies. Prominent among these practices are engaging in business in order to augment cost of crop production (3.57), seeking redress in court against oil companies (3.28), praying for God's intervention (3.2), planting of economic trees to generate income, receiving education on how to use modern storage facilities (2.74), involvement in community and individual level savings (2.48) and attending enlightenment programmes on coping with effects of crude oil production (2.39). However, the coping strategies adopted by the inhabitants are faced with challenges which include inadequate knowledge and information on human rights (2.6), limited skills to engage in new income (2.6), poverty (2.5), inadequate implementation of crude oil production policies (2.5), delay in court proceedings (2.4) and conflict over few available agricultural lands (2.4).

RECOMMENDATIONS

There is need for the government at local, state and federal levels to be committed in giving education the commitment it deserves. As revealed in the study, education is the greatest channel through which a society is empowered with the appropriate capacity to adapt to the ever increasing social and environmental changes. Inadequate infrastructural facilities hamper the people's capacity to adapt to the effects of oil and gas exploration and exploitation. There is therefore, the urgent need for government to adequately provide infrastructural facilities in the oil producing communities of the study area which is seriously lacking. The study reveals that there is need for the inhabitants to be economically empowered. Economic empowerment in the form of poverty alleviation will go a long way to enable the people to adapt economically having the necessary wealth and infrastructural facilities to enable them to be sustainable economically.

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