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ASSESSMENT OF ADAPTIVE CAPACITY OF COMMUNITIES TO CLIMATE CHANGE IN MBAKAANGE COUNCIL WARD, VANDEIKYA LOCAL GOVERNMENT AREA OF BENUE STATE, NIGERIA

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ABSTRACT

Information on adaptive capacity of communities to climate change in the Mbakaange Council Ward, Vandeikya Local Government Area of Benue State, Nigeria is lacking. Consequently, the study was conducted to provide information on the socio-economic characteristics and adaptive capacity of the people in five communities in the study area. Simple random and purposive sampling techniques were adopted to sample 250 respondents for the study. Descriptive Statistics and Adaptive Capacity were used to analyse the objectives of the study. The field result shows that the mean age of the respondents was 47years. Majority of respondents were married and mean household size was 14. Mean years of residence was 38 years while the estimated mean annual income of the people was ₦324,077.76. Adaptive Capacity (AC) was high among the people of Mbaikyo (4.39), Mbashaagba (3.58) and Mbapin (3.54) communities and low in Mbakunde (2.86) and Mbaakakwase (2.31) communities. The study recommends intervention geared towards enhancing the adaptive capacity of the people by the State and local authorities. These policies should be specifically geared towards low adaptive capacity areas with emphasis on poverty reduction.

Key Words: Adaptive, capacity, communities, Mbakaange

INTRODUCTION

Climate change has posed a lot of damage and it is an immediate threat to natural resources management in communities, villages, States, and even countries all over the world who depend on them for sustenance (Jacobs *et al.*, 2015). Climate change further exposes people to several hazardous, catastrophic and disastrous effects that leave unforgettable marks in their lives. It occurs sometimes as natural disasters, but at times it is out of shear carelessness of the people living in the area that brings about climate change hazards, like damping of refuse in residential areas can lead to flooding (Robert, 2009).

The tendency of systems (people) to adapt to impacts of climate change is greatly influenced by certain characteristics that are termed determinants of adaptation (Olmos, 2001). These characteristics include sensitivity (the degree to which a system is affected by the hazard or response to climate stimuli); vulnerability (degree to which systems are susceptible, unable to cope with an injury, or damages of effect influenced upon them) and resilience (degree to which a system absorbs, rebounds, resist or recovers from a stimuli). Adaptive capacity is the manner, potential or the ability of systems to get used to, adapt to climate change or alter to a better suit climate stimuli.

Awareness of climate change and adaptation to the impacts of climate change, is solely dependent on adaptive capacity most especially for the vulnerable systems. Human and natural systems have the capacity to cope with adverse circumstances, but with continuing climate

change, adaptation is needed to maintain this capacity (Noble *et al.*, 2014).

Adaptation depends greatly on the adaptive capacity of an affected system, region, or community to cope with the impacts and risks of climate change (IPCC, 2001). Therefore, enhancement of adaptive capacity reduces the vulnerability of any region, community or household and promotes sustainable development.
Literatures on adaptive capacity by Fussel and Klein (2006); Admassie and Adenew, (2007); Deressa *et al.*, 2009); Mertz *et al.*, (2009); Deressa and Rashid, (2010); Nelson *et al* (2010); Apata, (2001), Gbetibouo *et al.*, (2010) are associated with vulnerability assessment this could be attributed to the fact that adaptive capacity helps in reducing climate change vulnerability.

It is against this background that this study was conducted in five areas in Mbakaange council wards to examine the socio-economic characteristics of the people to assess their adaptive capacity to climate change impacts for decision making and policy.

METHODOLOGY

The study was conducted in Mbakaange Council Ward of Vandeikya Local Government Area of Benue State, Nigeria. Vandeikya is located between Latitude$7^0$5' and 7^0 15' North and longitude 9^o and 9^o 6' East. It has a land mass of 183,939 Square metres (0.7 sq. miles) with a population of well over 80,288 people according to Federal Republic of Nigeria (FRN, 2007) publication. Vandeikya is situated in the south eastern part of Benue State and shares boundary with the Obudu and Bekware in Cross River State to the East, Ushongo to the North and Konshisha LGA to the west. The map of the study area is shown in Figure 1. It was carved out of Gboko Local Government Area (LGA) in 1976 with the indigenous community dwellers being the Tiv people who speak the Tiv language.

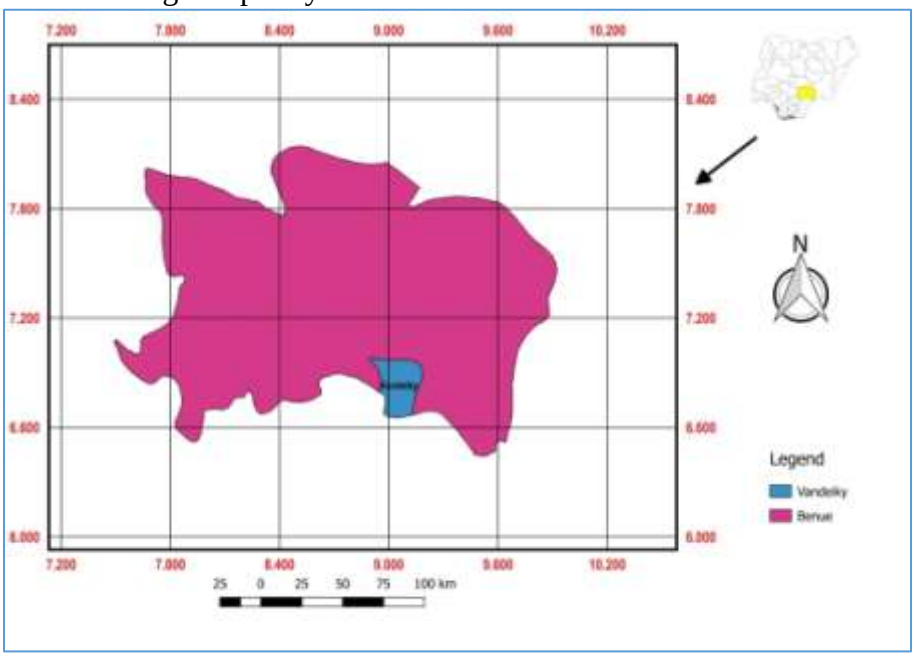

Fig. 1. Map of the Study Area
Source: Drawn from QGIS 2.16.3 Software with GRASS 7.0.4

Sampling Procedure and Sample Size

The population of the study consisted of the people living in the study area. Five communities in Mbakaange council ward were randomly selected for the study. Five villages were then selected randomly in each of the communities and 5 household also randomly selected in each of the villages. Two matured respondents were the purposively selected in each of the households in order to have persons who are knowledgeable and capable of providing appropriate answers to questions asked. Therefore, the sample size for the study was 250 respondents. The summary of the sampling procedure is presented in Table 1.

Data Collection

The study made use of the primary data. The primary data were collected with aid of a semi-structured questionnaire, oral interviews and personal observation. The data collected included the socio-economic variables of the respondents such as age, educational status, income and gender amongst others. Also, data on their adaptive capacity were collected.

Table 1. Summary of Sampling Procedure for the Study

Communities selected	Villages /communities	Household /Villages	Respondents / Household	Respondents/ Villages	Respondents/ Community
Mbashaagba	5	5*5=25	2*25=50	10	50
Mbapin	5	5*5=25	2*25=50	10	50
Mbaakakwase	5	5*5=25	2*25=50	10	50
Mbakunde	5	5*5=25	2*25=50	10	50
Mbaikyor	5	5*5=25	2*25=50	10	50
Total	25	125	250	50	250

Source: Field Survey, 2017**.**

Data Analysis

Descriptive statistical tools such as frequency, mean, and percentages were used to describe the socio-economic variables of respondents. Assessment of adaptive capacity of people to changing climate as adopted by (Abaje *et al.,* 2015) was used to determine the adaptive capacity (AC) of each of the communities in the study area. Adaptive capacity (AC) is expressed as:

$$AC = \frac{W+FI+ALL+IP+LL}{n}$$

Where :

AC = Adaptive Capacity

W = Wealth

FI = Farm inputs.

ALL = Availability of infrastructure and institution.

IP = Irrigation potential

LL = Literacy level.

Using the interval scale = 0.50,

The upper cut-off point was determined as 3.00 + 0.50 = 3.50

The lower limit as 3.00 – 0.50 = 2.50

The table below shows the classification of the Adaptation capacity.

Table 2. Classification of Adaptive Capacity

Mean Score	Level of Adaptive Capacity
0.0 - 2.49	Low Adaptive Capacity
2.50 - 3.49	Moderate Adaptive Capacity
3.50 - 5.00	High Adaptive Capacity

Source: Adopted from Abaje *et al.,* (2015).

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Respondents

Table 3 shows that majority of the respondents that provided information for the study were males (55.2%) while the females were (44.8%). The mean age of the respondents was 47 years. In terms of educational status, 33.6% of the respondents had secondary school education, 25.6% tertiary, 22.4% primary education and 18.4% for had non-formal education. Respondents who were engaged in farming were 42.4%, trading 21.6%, 18.4% were in the civil service, and 14.4% and students were 3.2%. The marital status of the respondents shows that 77.6% were married, singles were 18.4%, 1.6% divorced and 2.4% were widow(er)

The mean household size, period of residence in the locality and annual income of the people was 14, 38years and ₦324,077.76 respectively.

Table 3. Socio- Economic Characteristics of Respondents in Mbakaange Council Ward, Vandeikya Local Government.

Characteristics	Category	F (N=250)	%
Gender	Male	138	55.2
	Female	112	44.8
Age (years)	21-30	50	20
	31-40	60	24
	41-50	60	24
	51-60	32	12.8
	61and above	48	19.2
Mean Age (years)	47		
Educational level	Non formal	46	18.4
	Primary	56	22.4
	Secondary	84	33.6
	Tertiary	64	25.6
Major occupation	Civil servant	46	18.4
	Farming	106	42.4
	Hunting	8	3.2
	Trading	54	21.6
	Students	36	14.4
Marital status	Married	194	77.6
	Single	46	18.4
	Divorced	4	1.6
	Widow	6	2.4
Household size category	1-5	58	23.2
	6-10	90	36
	11-15	32	12.8
	16-20	24	9.6
	21-25	8	3.2
	26-30	20	8
	31and above	18	7.2
Mean Household size	14		
Period of residence category (years)	1-10	12	4.8
	11-20	42	16.8
	21-30	52	20.8
	31-40	54	21.6
	41-50	40	16.8
	51-60	20	8.0

	61and above	30	12.0

Table 3. Cont'd

Characteristics	Category	F	%
Mean period of residence (years)	38		
Annual income category (₦)	1000-50,000	44	17.6
	51,000-100,000	52	20.8
	101,000-150,000	24	9.6
	151,000-200,000	28	11.2
	201,000-250,000	22	8.8
	251,000-300,000	14	5.6
	301,000-350,000	12	4.8
	351,000-400,000	08	3.2
	401,000 and above	46	18.4
Mean Annual Income (₦)	324,077.76		

Source: Field Survey, 2017. N = Number of Respondents

Adaptive capacity of people to climate change in Mbakaange Council Ward, Vandeikya Local Area

The result on wealth consideration as an indices of adaptive capacity to climate change was high for the people of Mbapin (AC=4.08) and Mbaikyo (AC=4.04) as shown in Table 4. Moderate adaptive capacity was recorded among communities of Mbashaagba, Mbaakakwase, and Mbakunde with adaptive capacity of 3.56, 2.96 and.3.08 respectively. Low adaptive capacity was not recorded on wealth factor. In terms of farm inputs as indices of adaptive capacity to climate change, high adaptive capacity was recorded in Mbaikyo and Mbapin with adaptive capacity of 4.28, 3.64 respectively. Moderate adaptive capacity on farm inputs was documented for the people of Mbashaagba (3.44) and Mbakunde (2.64), whereas the people of Mbaakakwase community had low adaptive capacity of (1.80). Considering infrastructural and institutional availability as indices of adaptive capacity to climate change, the result shows that the people of Mbaikyo, Mbakunde and Mbapin recorded high adaptive capacity of 4.68, 3.56, and 4.24 respectively in their various communities. Moderate adaptive capacity of 3.40 was recorded on availability of infrastructural and institutional only in Mbashaagba community and low adaptive capacity of 1.6 was recorded in Mbaakakwase community.

Irrigation potentials as indices of adaptive capacity among the rural people was high in both Mbaikyo (4.64) and Mbashaagba (3.60), moderate in Mbapin (2.60) low in Mbaakakwase (2.24). Furthermore, literacy level as indices of adaptive capacity was considered high among the people of Mbaikyo and Mbashaagba who had 4.32 and 3.92 respectively. The people of Mbapin and Mbaakakwase had moderate adaptive capacity index of 3.12 and 2.92 respectively. However, literacy level was low among the people of Mbakunde with (AC=2.08).

A further examination of the mean adaptive capacity of all the rural communities in Mbakaange council ward shows that the people of Mbaikyo had the highest adaptive capacity (4.39) to the impacts of climate change and is ranked first (1st). Moderate adaptive capacity index was found among the Mbashaagba people with (3.58) and were therefore ranked second (2nd), followed by Mbapin community with a mean AC of 3.54 who were ranked 3rd, Also, the mean AC of 2.86 was recorded in Mbakunde community and were ranked 4th and lastly the people of Mbaakakwase came last with mean AC of 2.31 was ranked 5th.

Table 4. Adaptive Capacity of Communities in Mbakaange Council Ward to Climate Change

	Adaptive capacity variables	Mbashaagba	Mbaikyo	Mbaakakwase	Mbakunde	Mbapin	Mean	Rank
1	Wealth consideration as indices of adaptive capacity to climate change.	3.56	4.04	2.96	3.08	4.08	3.54	1
2	Farm inputs as indices of adaptive capacity to climate.	3.44	4.28	1.8	2.64	3.64	3.16	5
3	Infrastructure and institution as indices of adaptive capacity to climate change.	3.4	4.68	1.64	3.56	4.24	3.50	2
4	Irrigation potentials as indices of adaptive capacity to climate change.	3.6	4.64	2.24	2.96	2.6	3.21	3
5	Literacy level as indices of adaptive capacity.	3.92	4.32	2.92	2.08	3.12	2.27	4
Mean		3.58	4.39	2.31	2.86	3.54		
Rank		2	1	5	4	3		
Mean Adaptive Capacity of Mbakaange Council Ward		3.36						

Source: Field survey, 2017
Note that:
0.00-2.49 = Low adaptive capacity
2.50-3.49 = moderate adaptive capacity
3.50-5.00 = high adaptive capacity

DISCUSSION

The mean age of 47 years of the people is an indication that they are in their active years which is suitable for agricultural production. This finding agrees with the work of Olayide (1989) who reported that farming activities grew with age. Also, this age shows that the people were old enough to respond reasonably to the questions regarding climate change issues. Higher age of 53 years was reported in a similar study by Abaje *et al.*, 2015 in Kaduna State Nigeria. Large household size was recorded amongst the people of Mbakaange. High household size could be advantageous to the family if they are hard working. They can serve greater importance of food security than those with small household size. This finding is in line with (Bello *et al.*, 2013). However, Abaje *et al.*, (2015) averred that the more the number of births and people in a place the more aggravated their stress and burden becomes.

Majority of the people in the area were literate and this helped to improve their awareness and adaptation to climate change. Also, majority of the people were farmers and because of their continual work on the farm coped with their long stay in the area they were very experienced about the gradual changes that were taking place in their locality. The mean annual income of the people was ₦324,078.76. Higher income level reported in the area could be attributed to their hard work and high productivity of their crops. This could also help in adapting to impact of climate change. This finding is in line the work of Agbamu (2006) who reported the higher the income level of a farmer the less he or she would be disposed to fear of taking risk in respect of adopting a given technology.

In terms of wealth consideration as indices of adaptive capacity to impact of climate change, moderate adaptive capacity was reported in Mbaakakwase, while high adaptive capacity was reported in Mbashaagba, Mbaikyo, Mbakunde and Mbapin communities. With large wealth, the impacts of climate change and hence the vulnerability of the rural communities or households to climate change will be reduced. This finding is in agreement with the work of Cutter *et al.*, (2003) who reported that wealth enables rural communities to absorb and recover from losses and other impacts of climate change more quickly due to insurance, entitlement programs, number of livestock and economic trees owned, ownership of radio and television, and good quality of residential houses. Also, Fothergill and Peek

(2004) and Cutter *et al., (*2009) opined that people living in poverty are more vulnerable because they have less money to spend on preventive measures, emergency supplies and recovery efforts. The findings of this study is supported by the work of Marlin *et al* (2007) that adaptive capacity is higher in Canadian communities because of their large wealth and therefore, the communities are less vulnerable to the impacts of climate change.

Availability and affordability of infrastructure and institution in the community was also vital in the combat of adaptive capacity of climate change. This finding is in conformity with research by Gbetibouo *et al., (*2010) who reported the presence of access roads, health facilities, schools and microfinance banks for loans as vital for enhancing adaptive capacity of people to climate change.

High irrigation potentials were reported in the communities except the Mbaakakwase community who had low irrigation potentials. Communities with more potentially irrigable lands are expected to have a higher capacity of adapting to adverse climatic conditions and other economic shocks. This finding agrees with the works of (O'Brien *et a.,l* 2004 and Deressa *et al.*, 2009) who opined that irrigatable lands can help cub the problem of food security.

The literacy level of the communities as indices of adaptive capacity was high in the communities except in Mbakunde community. Higher level of literacy increase adaptive capacity by increasing capabilities and access to information which aids the people to cope with adversities. This finding is in conformity with (Thornton *et al.*, 2006; Gbetbouo *et al.*, 2010) who reported that literacy level of rural communities ascertains the level of skills and education among the rural people. Deressa *et al.*, (2009) also argued that communities or nations with high level of knowledgeable people are considered to have greater adaptive capacity than those with low literacy level.

Considering the adaptive capacity variables for the whole study area, wealth was ranked first, followed by infrastructure and institution, irrigation potentials, literacy level and farm inputs. This finding shows that wealth was the most important factor in adapting to the impacts of climate change in the study area. This

could be attributed to high productivity of farm crops, markets and assets owned by the people in the area.

In general, the mean adaptive capacity of Mbakaange Council Ward to the impacts of climate change was moderate. However, in terms of the communities adaptive capacity to impacts of climate change, the Mbaikyo community was ranked first, followed by the Mbashaagba, Mbapin, Mbakunde and Mbaakakwase community. This finding indicated that the Mbaikyo community adapted more to the impacts of climate change than the other communities.

CONCLUSION

Majority of the people in Mbakaange area were farmers and were also literate. Mbakaange Council Ward had a moderate adaptive capacity to impacts of climate change. Also, the communities differ on adaptive capacity to climate change impacts on five key indices (wealth, farm inputs, availability of infrastructure and institution, irrigation potential and literacy level) with wealth as the most important factor in adapting to the impacts of climate change in the study area, indicating that the communities level of adaptive capacity to climate change impacts is a function of their access to resources.

The study recommends the State and local authorities should development of climate change policies that would improve the adaptive capacity of rural communities with emphasis on poverty reduction.

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