

Climate Change and Livelihoods in Selected Rural Coastal Communities in Waterside Local Government Area in Ogun State

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Abstract. This study was on climate change and rural livelihoods in Makun-Omi, Ode-Omi and Iwopin communities in Waterside Local Government Area in Ogun State, Nigeria. Ex post facto design was adopted and three hundred and forty nine respondents randomly selected participated in the study. Analysis of data generated from an adapted Climate Change and Livelihoods' Questionnaire showed that participants' livelihoods activities were crop production, fishing and fishing related activities and non-farm activities. Eight types of manifestation of climate change ranked were flooding mean score 3.7, temperature mean score 3.64, rainfall mean score 3.6, water salinity mean score 3.54. Sea level mean score 1.51, heat waves mean score 1.48, drought with mean score 1.45 and storm activity mean score 1.36. The correlation matrix showed that temperature ($r = -0.4221$), rainfall ($r = -0.0788$), flooding ($r = -0.7469$) and water salinity ($r = -0.1949$) have negative relationship with livelihoods. It also showed that temperature ($r = -0.6480$), rainfall ($r = -0.5754$), flooding ($r = -0.5813$) and water salinity ($r = -0.0547$) all had negative relationship with livelihoods income at 0.05 alpha level. Therefore, the two null hypotheses were rejected. It is concluded that climate change increased poor livelihoods through reduction in agricultural production, poor outcomes of fishing and fishing related activities, low non-farm activities outcomes, loss of livelihoods income. It is recommended that inhabitants of these communities should be

trained on new strategies for sustainable livelihoods strategies.

Keywords: climate change, rural, livelihoods, coastal, communities.

1. Introduction

Living in rural coastal areas of Nigeria is becoming unbearable as the trends over time show that people have been contending with hardships caused by poor access to health services leading to high mortality rate, low income levels and poor ways of making a living. This situation occurs because the natural resources many coastal communities depend on for making a living have been declining due to exposures to disasters induced by climate change. As a result of the high level of human dependence on natural resources in these rural coastal communities, the rate and intensity of adverse effects of any long-term significant change in the "average weather" and shocks arising from climate change and perturbations directly lead to poor income and low productivity (Olawuyi & Rahji, 2012; Dube & Phiri, 2013).

Climate is the "average weather" that a given region experiences. Climate change occurs when there is variation in the mean state and other statistics of climate on all temporal and spatial scales beyond that of individual weather events. These events are in forms of high or low, cool or

hot or warm temperature, changes in rainfall pattern and melting of glaciers. All these changes affect water resources, agriculture and food security, human health, terrestrial ecosystems and biodiversity and coastal zones (United Nations Framework Convention on Climate Change, 2007). This is important because climate plays a dominant role in having a direct impact on productivity and physical production factors. With this, any change in climate equally generates high level of concerns (Aderogba, 2014).

Food and Agriculture Organisation (2016) notes that climate change has diverse effects on environment, human health, food security, economic activities, natural resources, physical infrastructure and agriculture. It also degrades environmental conditions of coastal communities thereby causing impoverishment of the population and making them the most vulnerable. The issue of climate change has become critical because of its likely negative effects on mankind, in areas of agricultural production, human health, fisheries, forest and forestry activities, impoverished soils, water scarcity, floods, droughts, poverty and hunger etc (Pongiglione, 2012; Amare & Waibel, 2014; Food and Agriculture Organisation, 2016).

Worldwide, climate change are observed in several forms like prolonged flooding, heat waves, drought, rise in sea level, water salinity, temperature and rainfall variations etc, all have become evident. People are directly exposed to changing weather patterns (temperature, precipitation, sea-level rises and more frequent extreme events) and indirectly through changes in the quality of water, air and food in addition to changes in ecosystems, agriculture, industry, human settlements and the economy. This has also led to the frequent incidences of increasing temperature, floods and storms as well as the transmission of infectious diseases which have persisted and frequently occurring in coastal areas (Intergovernmental Panel on Climate Change, 2001; Kennedy, Twilley, Kleypas, Cowan, Jr & Hare, 2002; World Health Organisation, 2009).

The extent of the effects of climate change on the vulnerable poor is directly associated with their livelihoods activities and level of survival. To this end, livelihoods have become an important determinant of the survival rate of vulnerable poor especially in communities where making a living is threatened by effects of climate change. In understanding this phenomenon, Chambers and Conway (1992) and Jayaweera (2010) state that livelihoods include “adequate stocks and flows of food and cash” to meet basic needs. It is broken down to include “capabilities, assets, (stores, resources, claim and access) and activities required” for a means of living. In the context of rural coastal communities, they stated that livelihoods may be a complex and changing process based on the peculiarity of the environment but it is widely accepted as the indicator of how people make their living. It also involves a person's ability and capacity to perform certain works of sustaining a basic lifestyle.

The severity of climate change globally has deprived people of their means of livelihoods, possessions eroded and their possible survival threatened. As a result of this, the level to which individuals understand the causes and effects of climate change, and the extent, to which they regard it as harmful to their ways of making a living and well-being correspond to their personal lifestyle decisions, survival instincts and the quality and quantity of natural resources available (Kangalawe & Lyimo, 2013). Apata (2016), Manyatsi, Mhazo and Masarirambi (2010) and Oruonye (2014) all reported that climate change is felt in Nigeria like other sub-Saharan Africa countries, and the vulnerability level caused by climate change on the environment is community-wide particularly in rural coastal communities covering sources of livelihoods like agriculture, food security, land use, energy consumption, biodiversity, health and water resources. Aderogba (2014) added that abnormal changes in temperature and rainfall and the increasing frequency and intensity of drought and floods occur in most parts of the states in Nigeria such as Benue, Cross River, Imo, Anambra, Kogi, Sokoto, Kaduna, Rivers, Bayelsa and others.

These abnormal changes have brought long-term implications for the viability and productivity of the world agro-systems especially among rural coastal communities. Arising from these, rural coastal livelihoods are no longer restricted to the traditional means of making a living due to changes brought about by several factors. Manyatsi, Mhazo and Masarirambi (2010), Kangalawe and Lyimo (2013), Aderogba (2014), Oruonye (2014) and Apata (2016) further note that in the context of climate change, households' decision to participate in different livelihoods activities is a common sign underscoring how the victims of these changes are striving to cope and stay alive. Olawuyi and Rahji (2012) observed that livelihoods in rural coastal communities are made up of numerous activities and strategies. They noted that because of the level of impacts of climate change, livelihoods diversification has been increasing, and strategies pursued by households and individuals are shaped by several factors like access to natural resources, which is getting restricted due to its rapid depletion.

The colossal effects of climate change on rural coastal communities cannot be taken for granted. In the opinion of Hassan, Khanam, Ibrahim and Zaman (2018) climate related changes are in form of potential additional stress on systems and the ecology in coastal areas degraded. These make inhabitants of coastal communities contend with conditions like floods, salinity intrusion, river bank erosion, cold waves, cyclone, tornado, arsenic contamination in ground water and water logging. In extreme weather conditions, coastal people are faced with risks and hazards that affect their livelihoods in many sectors including extreme poverty, malnutrition, and damage in crop cultivation, poultry, vegetables garden and fisheries. Other consequences like unemployment, food scarcity, health problems, and water crisis have been identified as major challenges in coastal communities. As a result, the affected people are losing their means of livelihoods and forced to take several alternative ways to survive with the adverse impact of climate change associated disasters (Intergovernmental Panel on Climate Change, 2001; WHO, 2009). In countries experiencing highest effects of climate change induced

disasters, the poorest with the least resources and capacity to adapt, are the most vulnerable. With these projected changes, the incidence, frequency, intensity, and duration of climate extremes (for example, heat waves, heavy precipitation, and drought), as well as more gradual changes in the average climate, will notably threaten their livelihoods, further increasing inequities between the developing and developed worlds (IPCC 2001).

The importance of climate change and its influence on people's means of making a living is of great importance and has attracted attention from researchers which has led to several studies. Some of the previous studies conducted include households' perception of climate change and human health risks using community perspective by Haque, Yamamoto, Malik and Sauerborn (2012), impacts of climate change on rural livelihoods in Madagascar and the potential for adaptation by United States Agency for International Development (2008) and an assessment of the trends of climatic variables in Taraba state Nigeria by Oruonye (2014).

However, literature shows that there is the need for more studies to focus on relationship between effect of climate change and livelihoods in rural coastal communities (Jayaweera, 2010; Egbe, Yaro, Okon & Bisong, 2014). Furthermore, the enormous effects climate change has on inhabitants of rural coastal communities because they largely depend on natural resources for their livelihoods should generate special attention from researchers and policy makers. Therefore, this study focused on climate change and livelihoods in rural coastal communities of Makun-Omi, Ode-Omi and Iwopin in Waterside Local Government area in Ogun State. The main objectives of this study were to determine the relationship between climate change and livelihoods in the rural coastal communities. It was also to determine whether there is any relationship between climate change and livelihoods income in the rural coastal communities. To achieve these, answers were provided to the research questions: what are the demographic characteristic and livelihoods in the study area? Is there any difference in ranking of climate change

manifestation in the rural coastal communities? Is there any relationship between climate change and livelihoods in the rural coastal communities under study, and what is the relationship between climate change, livelihoods and income in the rural coastal communities under study? The two null hypotheses tested were: there is no relationship between climate change (i.e change in temperature, rainfall, flooding and water salinity) and livelihoods in the rural coastal communities and there is no relationship between climate change and livelihoods income in the rural coastal communities.

2. Methodology

This study is ex post facto design because the researchers did not manipulate the independent variables. The population of the study is the inhabitants of selected rural coastal communities of Makun-Omi, Ode-Omi and Iwopin in Waterside local government area of Ogun State. The communities were purposively selected because they are rural in nature and are located on the coastal portion of Ogun State between Omu Creek to the North and the Atlantic Ocean/Coast to the South. The western boundary extends approximately 3 km into Lagos State and the eastern boundary also extends about 3 km into Ondo State (Olawuyi & Rahji, 2012). Because of their location they have also been experiencing climate change. Data and information collected about the population were of good representation of the population.

The population of the communities was about 103,200 as reported by 2006 population census (National Bureau of Statistics). However, pre-data survey to the three communities revealed that about 2,600 people in these communities were located close the coastal line. Consequently, simple random sampling technique was used to select a total of 349 participants from this population for the study. For the instrumentation, a 36 - item Climate

Change and Livelihoods Questionnaire adapted and modified from Rural Livelihoods Changes by World Bank (2010) and Household Questionnaire on Climate Change and Livelihoods by Dube and Phiri (2013) designed to generate demographic data from the participants residing in the three rural coastal communities. It also generated data on household profile and the independent variables, which included the livelihoods activities and climate change manifestations.

The instrument had six sections: Section A was the demographic part designed to generate personal data, such as age, gender, marital status and name of community. Section B was to generate data on the livelihoods activities. Section C was designed to elicit responses on climate change manifestations. Section D of the instrument was designed to generate data on the relationship between climate change and livelihoods, while section E was on income generated from livelihoods activities. All the items in the Section B, C, D and E of the instrument were close-ended, with modified four-point Likert scale that guided the responses weighted as follows: Strongly Agree (S.A) – weighted 4, Agree (A) – weighted 3, Disagree (D) – weighted 2 and Strongly Disagree (S.D) – weighted 1. The instrument was subjected to face and content validity and reliability using Cronbach Alpha test of internal consistency, which yielded 0.93 was administered to generate data on demographic information, ranking of climate change manifestations and livelihoods activities and the relationship between climate change and livelihoods activities and income. The procedure for data collection involved the researchers and two research assistants in the administering and collection of the questionnaire from the respondents in all the communities. Data were analyzed using descriptive statistics including frequency counts, percentage, mean and inferential statistics i.e. multiple correlation matrix at 0.05 alpha level.

3. Results and Discussion

Research Question 1: What are the demographic characteristic and livelihoods activities of participants?

Table 1: Distribution of participants by Gender, age and livelihoods activities

S/N	Demographic Variables	Frequency	Percentage
	Gender		
1	Male	187	58
2	Female	162	42
	Total	349	100
	Age		
1	Below 30	63	18
2	31-40	105	30
3	41-50	94	27
4	51-60	70	20
5	61-70	17	5
	Total	349	100
	Main Livelihoods Activities		
1	Crop Production	71	20
2	Fishing and Fishing Related Activities	213	61
3	Non-Farm Activities	65	19
	Total	349	100

Source: Field Survey by Researchers 2019

Table 1 above shows that a total of three hundred and forty nine (349) respondents participated in the study. Data generated reveals that they were made up of one hundred and eighty seven (58%) male and one hundred and sixty two (42%) female. The age distribution shows that sixty three (18%) of the respondents were below (30) years, one hundred and five (30%) were between (31-40) years, ninety four (27%) were between (41 -50) years old, seventy (20%) were within the range of (51-60) years while seventeen, five per cent were between (61-70) years old. This shows that bulk of the respondents two hundred and sixty nine (77%) were within the age range of (31-60) years which indicates that majority of the respondents were in their active years. The table shows that three main livelihoods activities were listed by the respondents. Further, three major livelihoods activities were reported by the respondents out which agricultural production accounted for seventy one (20%), fishing and fishing related activities accounted for two hundred and thirteen (61%) and non-farm activities accounted for sixty five (19%). This shows that the predominant livelihoods activities depend mostly on available natural resources and conform to the coastal nature of the study area.

Research question 2: Is there any difference in ranking of climate change manifestation in the rural coastal communities?

Table 2: Ranking by mean score of manifestations of climate change

S/N	Observed Changes	Mean	Rank
1	Rainfall	3.6	3 rd
2	Flooding	3.7	1 st
3	Water Salinity	3.54	4 th
4	Temperature	3.64	2 nd
5	Sea Level	1.51	5 th
6	Heat Waves	1.48	6 th
7	Drought	1.45	7 th
8	Storm Activity	1.36	8 th

Source: Field Survey by Researchers 2019

Table 2 above shows the mean score of the manifestation of climate change as the independent variables identified and ranked by the respondents. The ranking shows that flooding has the highest mean score 3.7,

second is temperature with mean score 3.64, third is rainfall with mean score 3.6 and fourth is water salinity with mean score 3.54. It also shows that sea level has the fifth highest mean score 1.51, sixth is heat waves with mean score 1.48, and seventh is drought with mean score 1.45 and storm activity recorded the eight mean score 1.36. This ranking shows that the intensity and occurrence of these manifestations vary and may be having different level of relationship with livelihoods in the rural coastal communities.

Research Question 3 and H₀₁: There is no relationship between climate change (i.e temperature, rainfall, flooding and water salinity) and livelihoods in the rural coastal communities

Table 3: Correlation Matrix of the Relationship between Climate Change (i.e temperature, rainfall, flooding and water salinity) and Livelihoods

	Livelihoods	Temperature	Rainfall	Flooding	Water Salinity
Livelihoods	1				
Temperature	-0.4221	1			
Rainfall	-0.0788	0.1414	1		
Flooding	-0.7469	0.2957	0.78803	1	
Water Salinity	-0.1949	0.0030	0.1160	0.0266	1

0.05 Level of Significance

From the correlation matrix result presented in Table 3 above, it shows the relationship exist between dependent variable i.e. livelihoods and all the independent variables. The correlation matrix shows temperature (r = -0.4221), rainfall (r = -0.0788), flooding (r = -0.7469) and water salinity (r = -0.1949) have negative relationship with livelihoods. Thus, as these independent variables increase, the dependent variable declines. Therefore, the null hypothesis was rejected. This finding confirms the earlier work of Dube and Phiri (2013) that increasing climate change in form of temperature, rainfall, flooding and other changes brought on the natural environment have negative relationship on rural livelihoods. It is also similar to the earlier findings Haque, Yamamoto, Malik and Sauerborn (2012) that local participants in their study reported changes in climate variability in temperature, rainfall and floods have negative relationship with means of living, human health, agriculture and overall livelihoods.

Research Question 4 and H₀₂: There is no relationship between climate change and livelihoods income in the rural coastal communities.

Table 4: Correlation Matrix of the Relationship between Climate Change (i.e temperature, rainfall, flooding and water salinity) and Livelihoods Income

Livelihoods Income	Temperature	Rainfall	Flooding	Water Salinity
Livelihoods Income	1			
Temperature	-0.6480	1		
Rainfall	-0.5754	0.0200	1	
Flooding	-0.5813	0.0710	0.0390	1
Water Salinity	-0.0547	0.0648	0.0470	0.0297

0.05 Level of Significance

Table 4 above shows the relationship between livelihoods income and all the independent variables. Temperature (r = -0.6480), rainfall (r = -0.5754), flooding (r = -0.5813) and water

salinity (r = -0.0547). The results indicate that temperature, rainfall, flooding and water salinity all have negative relationship with livelihoods income. This means that as these independent

variables increase the dependent variable i.e. livelihoods income declines. Based on this, hypothesis two is rejected. This result is similar to the earlier finding of Amare and Waibel (2014) that higher rainfall variability negatively affects non-farm activities by displacing, reducing demand for labour thereby causing reduction in household income. FAO (2016) also corroborates this finding that climate change induced changing temperature, rainfall and flooding cause economic consequences that negatively affect livelihoods income and limit household expenditures on critical needs like health and education. In this regard, it means that where the changes of these three variables occur, livelihoods income of the inhabitants without additional income sources decline.

4. Conclusion

This study revealed that majority of the respondents depended on natural resources for sourcing their livelihoods using the ocean and arable land for crop production, fishing and fishing related activities. The respondents identified flooding, temperature, rainfall and water salinity as the most importantly felt effects of climate change and the independent variables that affect their livelihoods activities. The results of multiple correlation matrix at 0.05 alpha level showed that temperature, rainfall, flooding and water salinity have negative relationship with livelihoods. It also showed that that temperature, rainfall, flooding and water salinity all have negative relationship with livelihoods income. This means that as these independent variables increase the two dependent variables i.e. livelihoods and livelihoods income decline. Therefore, the two null hypotheses were rejected. The result correlates with the fears of the inhabitants that climate change affects negatively their livelihoods activities, income and environment as a whole. As a result of this, it is likely the people of these communities will be compelled to evolve new livelihoods strategies as the effects of climate change are becoming more devastating and unbearable.

5. Recommendations

Based on the findings of this study, it is recommended that:

- Awareness campaigns and training should be embarked upon by government and other stakeholders to emphasize the causes and effects of climate change and adoption of sustainable use of natural resources. People highly vulnerable to climate change should be trained to develop new livelihoods strategies to cope with the current challenge.
- Government at all levels in Nigeria should invest more on rural infrastructure and provision of livelihoods assets in rural coastal communities in order to strengthen the livelihoods capabilities of the people.
- It is necessary for relevant government agencies to assess the level of resilience and vulnerability of rural coastal communities using broad indicators and provide alternative activities based on needs for the people.

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