Climate Change-Induced Displacement: Drivers, Challenges and Mitigation Measures

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Abstract: Large population displacements are now commonly presented as one of the most challenges of climate change. Recent forecasts and projections show areas that would be affected by such population movements are riverine, coastal and delta regions as well as low-lying islands. Climate change induced displacement brings about expanding urbanization that in turn weakens already vulnerable communities and people. This paper aimed to study climate change-induced displacement with emphasis on its drivers, challenges and mitigation measures. As such, data were collected from both secondary and primary sources. Secondary data were collected from relevant literatures while questionnaire and interview were adopted as a means of collecting primary data with the use of purposive sampling technique. The questionnaire were analysed quantitatively using factor analysis in the form of PCA, percentages and Kruskal Wallis whereas the interviews were analysed qualitatively. The study found that the core drivers of climate change-induced displacement are Persistent flooding, rising drought and advancing desertification while interview result confirmed flood and drought as key drivers. A Kruskal Wallis test conducted show no statistically difference from respondents on the challenges of climate change-induced displacement presented while the core mitigation measures are creation of disaster risk-reduction and management policies, reducing the emission of greenhouse gases, investments in clean technologies (e.g. hydropower, wind power) and agro-fuel production. The study concluded that disaster risk-reduction should be created and policies to ensure human rights are not violated should be enacted and maintained.

(Keywords: Climate change, Displacement, Flooding, Nigeria)

I.   INTRODUCTION

Throughout history, different reasons have made people to move. These movements maybe due to persecution and conflict, natural hazard events such as flooding or spilling disasters such as famine brought about by drought. Others choose to move temporarily or permanently in search of better economic conditions, or once seasonal conditions, such as rains, make it impossible or hard to earn a living (Shen, 2013; Lilleor and Van den Broeck, 2011; Piguet, 2010; Ibáñez and Vélez, 2008). Moreover, some circumstances have made governments to pursue programmes and policies which encourage movement and relocation of people from areas highly hazard-exposed. These movements either temporarily, permanent, forced or voluntarily is what this paper term displacement. The aim of this paper is to assess climate change-induced displacement with emphases on its core drivers, challenges and mitigation measures. Also, the research compares the responses from respondents across the states studied.

II.   CLIMATE CHANGE-INDUCED DISPLACEMENT

Large population displacements are now commonly presented as one of the most dramatic possible consequences of climate change. Recent forecasts and projections show those areas that would be affected by such population movements are coastal and delta regions including Sub-Saharan Africa Nigeria included and low-lying islands. Human activities on environment have complicated already complex picture of climate change. This is so because a changing climate will modify the intensity, frequency, duration, location and timing of sudden and slow onset climate-related hazards (IPCC, 2014a; 2012).

Slow-onset climate-related hazards comprise desertification, drought, ocean acidification, salinization, changing trends in seasons, glacial retreat and sea-level rise. Though not represented in the disaster displacement data, slow-onset hazards play a role in convincing people to move especially when government responses are inadequate to enable them to stay in a place or where there

are few choices left for survival (Adamo, 2003). Therefore, these types of hazards, that often have long warning times, can make people to migrate either permanently or temporarily, when livelihoods can no longer be supported or areas become uninhabitable as a result of drier and warmer seasons or the physical loss of ecosystem resources and land (Bremner and Hunter, 2014). Glantz (1999) posited that Slow-onset climate-related hazards usually have high impacts and last longer i.e. over months and years.

Similarly, Adamo (2009) posited that on a yearly basis, sudden-onset climate-related hazards contribute to large numbers of displaced persons through moving out of harm's way as well as evacuation. This is so because these types of hazards displaced over 24 million people in 2016 and over 10 million people in this current year 2018 (over flooding alone). In general they have displaced 32 times more people than any other geophysical hazards like earthquakes, and three times as many as those fleeing conflict (IDMC, 2017). Sudden-onset hazards comprise flooding, storms (e.g. typhoons), and extreme temperatures. However, the focus for this paper is on flooding partly because it is the most prevalent hazard in Nigeria (especially during the rainy season) and because of all of the ten largest disasters displacement events in recent times; were related to floods and storms. Also, between 2008 and 2017, sudden-onset events were responsible for about 99% of displacement internally: about 21 million people annually (ibid). This year data is yet to be compiled because the hazards are still ongoing.

Moreover, the roles of sudden-onset hazards in displacement have brought about warnings that climate change will cause mass population movements. Stern (2006) maintained that by 2050, 200 million people will be displace as a result of climate change. Similarly, the non-governmental organisation (NGO) Christian Aid has estimated that a billion people may be displaced by 2050 because of environmental reasons, although not climate change alone (Christian Aid, 2007). Others scholars estimated the number of 'climate migrants' to be between 25 million to 30 million a year (Myers, 1997; El Hinnawi, 1985). In recent time, report by the Environmental Justice Foundation (EJF, 2017) suggested that sea-level rise will lead to the displacement of hundreds of millions of people by 2100.

Climate change impacts are being felt already through increasing heavy rainfall and drought and it contribute to flooding, unusual high temperatures and sea-level rise (Blunden and Arndt, 2017). These changes in climate are impacting the ecosystems which are relied on for economies and livelihoods. Also, cultures and societies depend on it for food, water, waste removal and energy etc. (Cozzetto et al., 2013).

According to Steiner (2017), there is need for a protection agenda for people displaced by the impacts of climate change and disasters. He posited further that their numbers will increase, because since 1970, the risks of disaster displacement have doubled and numerous legal gaps need to be filled. Although a number of international initiatives have talked on these issues of climate change and displacement ; such as the World Humanitarian Summit, the Sustainable Development Goals, the New York Declaration for Refugees and Migrants, the Sendai Framework for Disaster Risk Reduction and in particular, the Nansen Initiative on Disaster-Induced Cross-Border Displacement and its replacement, the Platform on Disaster Displacement; more is required, with regard to both the capability to foresee displacement, and to decide what kind of 'protection' is called for, by whom, and where, thus the need for empirical research because most literature have been on forecast and estimation.

Additionally, most forecasts and estimations assume a deterministic approach based on the number of people living in areas that will be affected by flooding or sea-level rise, and conclude that about 150–200 million people could be displaced by 2050 because of climate change (Byravan and Rajan, 2006; Myers, 2002; Brown, 2008). However, such forecasts have caused widespread disagreement among the scholars, and have been repeatedly criticized for being too environmentally deterministic and not adequately grounded in empirical evidence (Black, 2001; Castles, 2002). Thus one of the gaps the research intends to fill.

The drivers of displacement today are intense and multifaceted, this is so because climate change can both contribute to conflicts that cause displacement, and can worsen existing displacement situations (IDMC, 2016). Thus, the drivers of climate change-

induced displacement include: persistent flooding, rising drought, advancing desertification, rising temperature, increasing deforestation, dehydration, spread of infectious diseases, malnutrition, damage to public health infrastructure, long-term effects of recurrent flooding, development in hazard-exposed locations, a decrease in essential resources (i.e. water; food production), armed conflict and violence among others.

Climate change brings about extreme weather events which in turn contribute to the destruction of people's natural life support base that has been already dwindled by over utilization of natural resources. These extreme weather events consist of higher drought, temperatures, and rising sea levels which contaminate groundwater as well as soil with salt, flood in coastal areas. Climate change induced displacement brings about expanding urbanization that in turn weakens already vulnerable communities and people. Other challenges include: competition over scarce resources, water insufficiency, food and energy insecurity, loss of livelihoods (Naser M. M. and Afro, 2009; UNHCR, 2017). Overall, the risk of climate-related displacement is predominantly high in countries that do not have the resources or capability to prepare for climate change (i.e. low adaptive capability and low resilience) such as developing countries, Nigeria inclusive. Furthermore, the most vulnerable people are the underprivileged, who live in the risk areas and cannot protect themselves. These people contribute the least to global greenhouse gas emissions yet, are the most severely affected by the penalties of climate change (UNHCR, 2017).

From the foregoing, the impacts of climate change-induced displacement are enormous. Hence, the need to have proper and well maintained mitigations measures in place. For this study, the mitigation measures consider are investments in clean technologies (e.g. hydropower, wind power), agro-fuel production, forest conservation projects, the re-establishment of marshlands, disaster risk-reduction and management policies as well as reducing the emission of Greenhouse gases.

III. MATERIALS AND METHODS

This study is limited to four (Kwara, Niger, Benue and Kogi) of the six states in the middle belt of Nigeria majorly hit by flooding year in year out. Similarly, three local governments severely affected from Niger (Mokwa, Lavun, Agaie and Lapai), Benue (Makurdi, Buruku, Tarka and Agatu), kogi (Kogi/Kotonkarfi, Ofu, Idah and Ibaji) were selected. For Kwara, only two local governments badly affected were selected; there are Moro and Ilorin West. Secondly, these states were selected because they lie along the two major rivers (Niger and Benue) in Nigeria. Release from dams (i.e. Kainji, Jebba, and Shiroro all in Nigeria and Lagdo Dam in neighbouring Cameroun) during the heavy raining season cause the rivers to over flow their banks which in turn flood the communities of these states and hence, result to peoples' displacement.

Both secondary and primary data were used in this study. The secondary data sources used are UNHCR reports, reports and documents published by government and non-governmental organizations as well as individuals. The sampling technique employed is purposive because of the sensitivity of the issues examined and also because respondents' consistency and capability is required. Moreover, Purposive sampling technique can be more accurate than randomization with regards to time, effort and cost needed in finding respondents (Seidler, 1974; Snedecor, 1939); thus, one of the reasons for its selection. Furthermore, according to Benard (2002), purposive sampling is effective when dealing with studies that require the use of both qualitative and quantitative techniques. Hence, information was gotten from informed citizens from the regions such as teachers, civil servants, literate farmers, traditional rulers etc.

The primary data used were the questionnaire and interview to illicit information on the drivers, challenges and mitigation measures for flood-induced displacement. The questionnaire designed was in four parts (section A – D; A deals with knowledge of climate change-induced displacement in general, B deals with its drivers, C deals with challenges while D deals with mitigation measures). A total of 190 questionnaires were received from 300 distributed (42 from Kwara, 50 from Kogi, 48 from Benue and 50 from Niger). A response rate of 63.3% and according to Dillman (2000) and Takim et al. (2004), response rates

from questionnaire survey can be 20% to 30% at minimum; therefore having 63.3% (190 respondents) response rate for this study is above the expected response rate. Oral interview were also conducted with the aim to illicit informed and detail information from those respondents who could not read or write. These sets of people include heads of household, rural women, farmers, fishermen etc.

IV.   RESULTS AND DISCUSSIONS

Prior to analysis, the responses from the questionnaires were subjected to reliability and validity test. According to Forza (2002), these tests are necessary to assess the quality of a research instrument. The results from reliability test using Cronbach's alpha is 0.848. This shows that the constructs of the questionnaire have internal consistencies because according to Swafford et al., (2006a) a Cronbach's alpha of 0.70 or higher is usually used to establish reliability of a construct. Validity of the research is enhanced because most of the items for the questionnaire were obtained from the background of the study and also, completed questionnaires were inspected for completeness and uniformity before data analysis. As a result, the instrument can be said to be of good construct validity (O'Leary-Kelly and Vokurka, 1998).

To determine the core drivers of climate-induced displacement, a factor analysis in the form of principal components analysis (PCA) was computed with the help of SPSS 20 version. However, prior to computing PCA, the appropriateness of data for factor analysis was evaluated using Kaiser-Meyer-Olkin and Bartlett's Test of Sphericity. In addition, the correlation matrix which was examined revealed the presence of many coefficients of .3 and above. The Kaiser-Meyer-Olkin value was .796, exceeding the recommended value of .60 (Kaiser 1970, 1974) while Bartlett's Test of Sphericity was statistically significant i.e. p = .000 (significant value should be .05 or smaller) (Bartlett, 1954); hence supporting the factorability of the correlation matrix.

Table 1: PCA of Drivers of Climate-induced displacement

Component/Drivers	Initial Eigenvalues			Extraction Sums of Squared Loadings			Total
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
Persistent flooding	3.398	33.977	33.977	3.398	33.977	33.977	2.619
Rising drought	1.234	12.344	46.320	1.234	12.344	46.320	1.964
Advancing desertification	1.139	11.389	57.709	1.139	11.389	57.709	2.212
Rising temperature	.841	8.406	66.115				
Increasing deforestation	.812	8.122	74.237				
Increasing dehydration	.605	6.054	80.291				
Long-term effects of recurrent flooding	.571	5.715	86.006				
A decrease in essential resources	.529	5.287	91.293				
Development in hazard-exposed locations	.459	4.590	95.883				
Increase malnutrition	.412	4.117	100.000				

Source: Authors' field survey, 2018.

Of the ten drivers assessed, only three drivers with eigenvalues exceeding 1 (Table 1), explaining 33.977%, 12.344% and 11.389% of the variance respectively were retained as core drivers for climate-induced displacement. Thus, from Table 1, the core drivers are Persistent flooding, rising drought and advancing desertification. This result is in agreement with literature because

flooding is the most hazards ravaging the country from north to south. Similarly, Director General (DG) of National Emergency Management Agency (NEMA) in 2018 posited that:

'Floods and drought had become basis of major worry for government all over the world. He stated further that in 2012 flooding across the country, 7 million people were affected. 2.3 million were displaced; 597,476 houses were destroyed and over 363 people lost their lives. He gave the total estimated loss and damage as 2.6 trillion naira. For this year, the NEMA DG warned that the flood might grow higher than what was experienced in 2012 due to the fact that in 2012, the flood level rose to 12.84 metres on 29th September, and as at September 21, 2018 the level of flood had reached 11.21metres' (Vangrdng, 2018).

Estimates for affected people and loss of livelihoods are yet to be out; reason been that rain is still falling. In an interview in Kwara, a respondent posited when asked the main driver of displacement that:

'Flood has been seriously ravaging this community since my birth and the effect have increase in recent years. The flood have affected out farmlands, businesses, infrastructures and general livelihood. The worst part is that government efforts are yielding little or no results'. (Interview transcript)

In another interview with community leader in Kogi state; when asked the major driver of climate change-induced displacement he stated that:

'During raining season and between July and September, our communities been an area located along river Niger and Benue (confluence state) is flooded with water year in year out partly due to rainfall and partly due to release from dams (Kainji and shiroro and Jebba) in Nigeria and Lagdo in Cameroun'. These make the two major rivers to over flow their banks into the communities. Hence, the main driver is persistence flooding (Interview transcript)

Furthermore, in Benue state, when asked the major effect of climate change a respondent posit that

Flooding is major effect of climate change that causes people to move. He stated further that the flooding is majorly due to over flow river Benue bank due to release from Ladgo dam in neighbouring Cameroun. Similarly, due to drought and desertification in far north of the country, herdsmen move in their numbers towards the middle birth especially our state for pasture. This cause clashes among the herders and farmers as well as other members of the community (Interview transcript).

In Niger state, the respondents maintained that flooding is the major effects of climate change as one respondent posit:

As a result of the three major dams (Kainji, Shiroro and Jebba) in Nigeria been located in this state, the state is worst hit anytime there are releases of water from the dams. This is couple with heavy rainfall witness between July and September. People and livestock dies, goods perish and inhabitants are made to cope with their losses because of little or no relief fund (Interview transcript).

On the challenges, Table 2 presents the result. 50.5% of the respondents across the states studied strongly agree to the challenges presented, 42.0% agree, 5.7% were undecided, 1.1% disagree while 0.7% strongly disagree. This shows that the challenges posed by climate change-induced displacement are the same across the states considered.

Table 2: Challenges of Climate-induced Displacement

Challenges	Strongly disagree	Disagree	Undecided	Agree	Strongly agree
Food and Energy Insecurity	1	3	14	88	84

Loss of Livelihoods	3	2	8	68	109
Competition over Scarce Resources	1	2	9	85	93
Water Insufficiency	1	2	14	80	93
Increase Violent	1	2	6	78	103
Destruction of the environment	0	1	12	76	101
Increasing urbanization	1	3	10	75	101
Spread of infectious diseases	2	1	14	89	84
Total	10	16	87	639	768
Percentages	0.7	1.1	5.7	42.0	50.5

Source: Authors' field survey, 2018.

However, to confirm this assertion, a Kruskal Wallis test was conducted to check if the responses across the studied areas were statistically different, Table 3. The result revealed no statistically different in the challenges faced by respondents across the four states studied. This is so because according to Pallant (2010), if the significant level is less than .05 (e.g. .04, .01, .001 etc.); one can conclude that there is a statistically significant difference among the groups examined. In Table 3, however, significant level are well above .05, hence, it can be concluded that the challenges faced as a result of climate change-induced displacement are the same across the studied states.

Table 3: Kruskal Wallis Test on Challenges posed by Climate change-induced Displacement

	Food and Energy	Loss of Livelihoods	Competition over Scarce Resources	Water Insufficiency	Increase Violent	Destruction of the environment	Increasing urbanization	Spread of infectious diseases
Chi-Square	7.743	1.544	2.195	.850	2.641	7.981	4.122	6.998
df	4	4	4	4	4	4	4	4
Asymp. Sig.	.101	.819	.700	.932	.620	.092	.390	.136

Source: Authors' field survey, 2018.

Furthermore, and in line with the above result, Dr Hansen of the NASA Goddard Institute for Space Studies said:

'If the causes of climate change is not controlled,… there will be devastating effects, including increased frequency of floods and droughts, increasingly rapid sea level rise, and increased pressure on plants and wildlife because of changes in the environment (Earth Climate Approaches Dangerous Tipping Point, 2007)'

Similarly, in an interview with a respondent in Niger:

'The effect of climate change especially flood when it occur takes away everything. Our houses, properties, ancestral land are washed away and when we move, it is not easy on us or the people we meet there'.

To determine the core mitigation measures of climate-induced displacement, a factor analysis in the form of principal components analysis (PCA) was also computed with the help of SPSS 20 version. The data met the requirement for PCA because the correlation matrix which was examined revealed the presence of many coefficients of .3 and above and the Kaiser-Meyer-Olkin value was .702, exceeding the recommended value of .60 (Kaiser 1970, 1974) while Bartlett's Test of Sphericity was statistically

significant i.e. p = .000 (significant value should be .05 or smaller) (Bartlett, 1954); hence supporting the factorability of the correlation matrix.

Table 4: PCA of Mitigation Measures for Climate-induced displacement

Component/Mitigation measures	Initial Eigenvalues			Extraction Sums of Squared Loadings			Total
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
Creation of Disaster Risk-Reduction and Management Policies	1.475	21.071	21.071	1.475	21.071	21.071	1.285
Reducing the Emission of Greenhouse Gases	1.068	15.255	36.326	1.068	15.255	36.326	1.173
Investments in Clean Technologies (e.g. Hydropower, Wind Power)	1.039	14.837	51.163	1.039	14.837	51.163	1.134
Agro-Fuel Production	1.000	14.291	65.454	1.000	14.291	65.454	1.096
Establishment of Forest Conservation Projects	.908	12.975	78.429				
Re-Establishment of Marshlands	.833	11.894	90.323				
Building setbacks	.677	9.677	100.000				

Source: Authors' field survey, 2018.

Of the seven mitigation measures assessed, only four with eigenvalues exceeding 1 (Table 4), explaining 21.071%, 15.255%, 14.837% and 14.291% of the variance respectively were retained as core mitigations for climate change-induced displacement. Therefore, from Table 4, the core mitigation measures are creation of disaster risk-reduction and management policies, reducing the emission of greenhouse gases, investments in clean technologies (e.g. hydropower, wind power) and agro-fuel production.

Mitigations against the effect of climate change are necessary As Kyung-wha Kang (2008), one time UN Deputy High Commissioner for Human Rights stated:

…ultimately climate change affect the very right to life of various individuals…[countries] have an obligation to prevent and address some of the direst consequences that climate change may reap on human rights.

Similarly, a respondent in one of the interviews in Niger state maintained that:

Government and well-meaning Nigerians needs to come to our aid. According to him, the impact of climate change-induced displacement is enormous and sometimes people affected never regain from their losses in a whole lifetime.

V. CONCLUSION

The subject of climate change today is an essential part of the present global discus. Climate change have been affecting the environment for a very long time now and in recent time, the impact cannot be over looked especially as regards to displacement. Although, the causes of displacement prompted by climate change, such as flooding, drought, rising temperature desertification identified as the core drivers of displacement in this paper are not new; their extent and occurrence are likely to increase. The worrisome scenario of this climate change-induced displacement as revealed in the areas studied is that the underprivileged who cannot protect themselves are the most severely affected. These people lose their homes, sources of livelihood to the effects of this climate change. Eventhough, they contribute the least to global greenhouse gas emissions (UNHCR, 2017). To reduce the

impact, the study revealed that disaster risk-reduction should be created and policies in line with international standards should be

formulated so as to help affected people and regions.

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