

DISASTER RISK MANAGEMENT AND SUSTAINABLE DEVELOPMENT IN SELECTED AFRICAN COUNTRIES

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ABSTRACT

Experts had reiterated that sustainable development is aimed at meeting the needs of the present generations without compromising the ability of future generations to meet their own needs. This had made every continent to focus on the Sustainable Development Goals (SDGs), officially known as *transforming our world: the 2030 Agenda* for Sustainable Development. Among the agenda are the issues on disaster management. This study therefore examined the effect of disaster-risk management on sustainable development in Africa for the year 2013. Data sourced from World Bank database were analyzed using Ordinary Least Square (OLS), since the data were cross-sectional in nature. The result showed that disaster-risk reduction is significantly meaningful in African region as it improves the level of sustainable development and generate income to Africa countries through mineral extraction. The results also showed that financial development, political stability and higher income also improved the level of sustainable development in Africa, but not significant. We therefore recommended that effective disaster management should not only directly apply to African countries, but should also be applied indirectly to areas of extractive activities in African region.

Keywords: Sustainable development, Disaster management, Africa, Political stability, SDGs

INTRODUCTION

The Official Agenda for Sustainable Development adopted on 25 September 2015 has 92 paragraphs, with the main paragraph (51) outlining the 17 Sustainable Development Goals and its associated 169 targets. This included the following goals: poverty, food, health, education, women, water, energy, economy, infrastructure, inequality, sustainability, habitation, consumption, institutions, climate, marine-systems and ecosystems. The last three goals are concerned with disaster-risk management, that is, taking urgent action to combat climate change and its impacts, conserve and sustainably use of the oceans, seas and marine resources for sustainable development and protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss.

Disasters could be said to be an outcome of a continuing risk process, in which the prevailing circumstances of hazards, exposure and vulnerabilities combine to generate disaster risk. In Africa, risk has grown and accumulated over time. It is now becoming evident that greater losses occur only when a hazard event strikes (see Noy, 2009 for macroeconomic outcome of disasters). This is a radical shift from earlier ideas of disasters as acts of God or as natural events. A geophysical hazard event may be natural but its impacts depend on the circumstances of people, households and societies, which in turn arise from diverse micro- to macro-level political, social, economic and environmental processes. Knowledge of the driving factors in disaster-risk is the essential basis for pre-emptive policy and action to reduce the risks (International Council for Science, 2014).

Of recent, studies show negative effects of natural disaster on growth (see Toya & Skidmore, 2007; Noy, 2009; Klomp & Valckx, 2014; Felbermayr & Groschl, 2014), while other studies give opposite view (see Caselli & Malhotra, 2004), but we find it difficult to trace any study on disaster management and sustainable development. Therefore, our motivation for this study stems from the fact that most African countries have adopted the United Nations-sponsored Hyogo Framework for Action 2005-2015, which seeks to build the resilience of nations and communities to disasters, includes the integration of disaster risk considerations into sustainable development processes as a key strategy; through their regional union such as African Union (AU), Economic Communities for West African Countries (ECOWAS), among others. One of its five priorities is the reduction of underlying risk

actions, involving environmental, social and economic actions. Meanwhile, explicit recognition of disaster risk reduction in the Sustainable Development Goals will provide critical weight to help drive the substantive work underlying disaster risk in the African continent.

Countries and regional organisations have made significant strides in addressing disaster risk reduction in African regions. It was reported at the 4th Africa Regional Platform on Disaster Risk Reduction held at Tanzania on 13-15th February, 2013 that Mozambique has invested 5.2% annually from national budget on disaster management. It was indicated that Egypt had no formal budget allocation for disaster risk reduction, but Egypt is making significant investment on disaster risk reduction through their decentralised state system. Similar examples are to be found in countries like Burundi, Madagascar, Nigeria and Togo.

From the foregoing, we ask: of what significance has this effort on African sustainable development? Thus, the study made attempt to answer this question by examining the effect of disaster-risk reduction management on sustainable development in some African countries. The remaining part of the study focused on literature review, methodology, discussion of results and then concludes the paper.

LITERATURE REVIEW

The Concept of Disaster Management

Disaster management is anchored on the objective of reducing the effects of disaster and effectively takes action to get society's condition back to its pre-disaster status. Stakeholders on disaster management take pre-disaster or post-disaster actions to reduce the potential effects on a disaster to the point of elimination. On the other hand, the nature of disasters may make this ideal situation unattainable. According to National Research Council (NRC, 2007), disasters are normally characterized with five major features that make them hard to overcome, thus; disasters are large, rapid-onset incidents relative to the size and resources of an affected jurisdiction. Disasters are uncertain with respect to their occurrence and their outcomes. Risks and benefits are difficult to assess and compare. Disasters are dynamic and relatively rare events. These characteristics make it difficult to manage disasters.

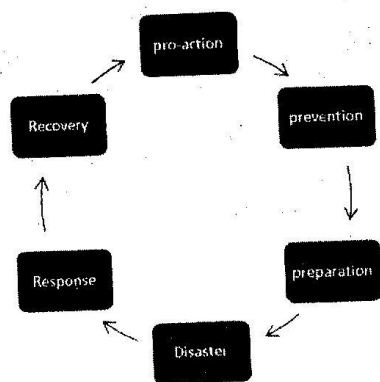


Figure 1: Disaster management cycle
Source: Brooijmans (2008), Grothe, Landa, & Steenbruggen (2005)

Figure 1 shows Safety Cycle or the disaster management Cycle as it is normally called. It contains the six major inter-related stages, namely pro-action, prevention, preparation, disaster, response and recovery. The process of creating awareness, performing threat and vulnerability analyses, and designing and constructing resilient systems excluding risks is known as *Pro-action*. *Prevention* stage is concerned with the minimization of risks and

consequences, the installation of forecasting systems, and issuing regulations and permits (limiting risks). An emergency plan is written, the emergency organisation is installed, trained and tested for its Full Operational Capability (FOC), and the materials and equipment needed are made available in the *preparation stage*. In the *response stage*, the elimination of sources and side-effects is the major focus. The *recovery stage* is concerned with the evaluation of response phase and modifications to the emergency plan, the damage (if any) is repaired and people are compensated (Grothe, et. al, 2005; Markus, Fiedrich et al, 2004).

Concept of Sustainable Development

Sustainable development is concerned with the needs to meet the basic necessities of the present generations without compromising the ability of future generations to meet their own needs. The Sustainable Development Goals (SDGs), officially known as transforming our world: the 2030 Agenda for Sustainable Development are an intergovernmental set of aspiration Goals with 169 targets. The Goals are contained in paragraph 51 United Nations Resolution A/RES/70/1 of 25 September 2015. The Resolution is a broader intergovernmental agreement that, while acting as the Post 2015 Development Agenda (successor to the Millennium Development Goals), builds on the Principles agreed upon under Resolution A/RES/66/288, popularly known as The Future We Want.

Hamilton and Clemens (1999) suggested that the concept of sustainable economic development is applicable to the developing countries. It is therefore directly concerned with increasing the material standard of living of the poor at the 'grassroots' level, which can be quantitatively measured by means of increased food, real income, educational services, health-care, sanitation, and water supply, emergency stocks of food and cash, etc., and only indirectly concerned, with economic growth at the aggregate (Pardi, Salleh & Naw, 2015). Brundtland Report (1987) described that *sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of needs, in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.*

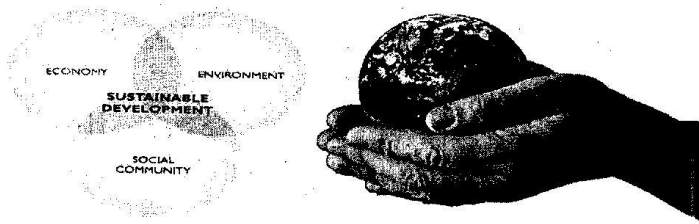


Figure 2: Sustainable development as a system
Source: Ankit Jain (2015)

The consensus is that the primary objective is to reduce the absolute poverty (in whatever form) of the world's poor through providing lasting and secure livelihoods that minimize resource depletion, environmental degradation, cultural disruption, and social instability. A careful look at Figure 2 shows that the definitions of sustainable development require that we see the world as a system-system that connects space; and a system that connects time. When we think of the world as a system over space, we grow to understand that air pollution from West Africa affects air quality in Asia, and that pesticides sprayed in Niger could harm fish stocks off the river Niger which could as well affect Nigeria in turn. And, when we think of the world as a system over time, we start to realize that the decisions our grandparents made about how to farm the land continue to affect agricultural practice today; and the economic policies we endorse today will have an impact on urban poverty when our children are adults (International Institute for Sustainable Development, IISD, 2013).

Disaster Management and Sustainable Development: The link

It is no more news that disasters, development and poverty are closely linked. Given the circumstances we are now facing, achieving sustainable development is of vital importance to every country in Africa. ICS (2014) stated that destruction of assets and livelihoods in disasters set back hard-won development gains and worsened poverty, even for extended periods of years. The efforts to end extreme poverty may be reversed in the face of a disaster event and poverty may be re-entrenched. In many African countries, disaster impacts are growing, which often manifested with rapid growth and unsustainable development practices that increase the exposure and vulnerabilities of communities and capital assets. Therefore, many governments continue to recognise that the reduction of disaster risks is a foundation for successful sustainable development. The disaster risk is a cross-cutting issue requiring action across multiple sectors of Africa (ICS, 2014).

Figure 3 shows that various impediments such as political or social conflicts, financial crises, diseases like Tuberculosis, HIV/AIDS, environmental degradation and natural disasters reduce efforts to create a sustainable development. Natural disasters trigger especially devastating consequences, and are compounded by other factors. Disaster risk management is therefore essential for the realization of sustainable development.



Figure 3: Sustainable Development and Disaster
Source: Developed by the Authors

Disaster normally damages livelihoods and sustainable economic development can be impossible, which can set the preconditions for further rounds of excessive exposure, susceptibility and loss, blocked escapes from poverty and negative spirals of development failure. Disasters break off society by claiming lives, creating victims and destroying infrastructure and buildings. Disasters have a negative impact on three main components of sustainable development—society, economy and environment. This makes the proper management of a disaster an absolute necessity (NRC, 2007; Mansourian, Rajabifard, Valadan Zoej & Williamson, 2006).

African countries and Disaster Management Towards Sustainable Development

The incidence of disasters is said to occur when hazards and vulnerability meet. It was reported that out of 100% disasters that occur worldwide, only 20% normally affect Africa nations. However, the 20% that occur makes Africa suffers 60% of all disaster-related deaths (Loretti & Tegegn, 1996). This is probably due to the type of hazards that affect this continent or because of the economic situation of Africa. Following this scenario, it is easy for any disaster to escalate or to have multiple effects in this region. It was reported by the World Bank research team that most African countries are undergoing rapid economic growth with an increase in the incidence of disaster. This is because most African nations are extractive industry dependent. Therefore, the need to reduce and manage the risk of natural and man-made disasters is greater than ever as just one major disaster can significantly stunt a nation's economic growth. The number of disasters reported in Africa has increased significantly (since the 1970s) and their economic impact on countries is becoming more and more apparent (World Bank, 2013).

Over the years, Sub-Saharan Africa has experienced more than 1,000 disasters which revolve around natural hazards; mainly epidemics, endemic diseases, drought, floods, agricultural pests and bush fires, but some areas are also susceptible to earthquakes, cyclones and volcanic eruptions (World Bank, 2013). The natural hazards interact with man-made ones, such as armed conflicts, air, road and railway incidents, other industrial hazards such as mining accidents, chemical spills, etc., and with widespread vulnerability. The context is one of rapid population growth, forced movements of population, environmental degradation, precarious urbanization, food insecurity, poverty, fragile economies, infrastructures and institutions, and cultural and political instability.

The majority of disasters in Africa are hydro-meteorological in nature, with droughts still affecting the largest number of people on the continent and floods occurring frequently along the major river systems and in many urban areas. Cyclones mainly affect Madagascar, Mozambique, and some of the Indian Ocean islands. Geological hazards are less pronounced and predominately appear along the Rift Valley. Climate change will also trigger a higher magnitude and frequency of these extreme weather events. Sea level increases, coastal erosion, and storm surges are a very real threat for low-lying coastal areas. Sub-Saharan Africa's disaster profile is closely linked to the vulnerability of its population and economies and exacerbated by minimal coping capacities (Africa Region Disaster Risk Management Team, 2010). Most African countries have limited resources to invest in disaster risk reduction and minimal fiscal space to fund relief and recovery efforts after a major disaster. Disasters can be a tremendous setback for economic growth and performance. Poor, small island states and land-locked countries are particularly vulnerable to the economic impact of disasters. The capacities of many national and local disaster prevention and response authorities remain limited. In many areas, the economy is based on rain-fed agriculture, which is highly susceptible to climate variability. The massive increase in vulnerable households, as well as whole communities, is closely related to the overall decline in human development in most African countries. Reversing this trend requires new approaches to humanitarian aid and new commitment and partnership from all sectors - communities, private sector, civil society, governments and the international community. Among the approaches adopted for disaster-risk management in African continent include:

- * The Algiers Plan of Action which is a focused framework for action to impact in the areas of health, HIV/AIDS, food security and institutional capacity building. This initiative paralleled work is being done with some organizations notably the African Union, to build new frameworks within which African solutions could be found for Africa's problems (see International Federation of Red Cross and Red Crescent Societies, IFRC, 2006).
- * Having realized that disaster risk reduction (DRR) is an important pillar for sustainable development, World Bank incorporates this phenomenon as an integral part of the World Bank's activities in Sub-Saharan Africa. The Hyogo Framework for Action (HFA) is the primary global framework for DRR. Together with the United Nations International Strategy for Disaster Reduction (UNISDR), the African Union (AU) and other development partners, the World Bank and the Global Facility for Disaster Reduction and Recovery (GFDRR) are key partners with aim of supporting its implementation. The World Bank's disaster risk management (DRM) activities in Sub-Saharan Africa are coordinated by the Africa DRM Team. The national governments, their national DRM organizations, and national platforms are key partners for its implementation. To put these objectives into practice the Africa DRM Team launched risk and vulnerability assessments as its first set of activities. They initially covered economic impacts, flooding in urban areas, water resources management, drought and food security, marine environments, as well as capacity building initiatives (Africa Region Disaster Risk Management Team, 2010).
- * Budgetary allocation in each African country also serves as sign of DRR preparedness. For example, it was reported at the 4th Africa Regional Platform on Disaster Risk Reduction of 13-15 February 2013 held at Arusha, Tanzania that Mozambique has invested significantly (approximately 5.2% of its national budget) in disaster risk reduction through hazard-proofing sectorial investments, since the 2000 floods. Egypt, in its annual reporting on the implementation of the HFA (2009-2011), indicated no formal budget allocation for disaster risk reduction, yet on further investigation, clearly Egypt is making significant

investment on disaster risk reduction through their decentralised state system. However, the reporting of such spending is not evident in reporting on expenditure on programmes. Similar examples are to be found in countries like South Africa, Burundi, Madagascar, Nigeria and Togo.

- * ECOWAS has also adopted a regional policy for disaster risk reduction in 2007 and a Plan of Action has been taken place from 2010-2015. It also organised DRR Division to develop and validate a new guideline for strengthening National Platforms in Member States. It supports (10) countries on strengthening National Platforms in the region (Benin, Burkina Faso, The Gambia, Guinea, Liberia, Mali, Sierra Leone, Cote d'Ivoire). Member States are being encouraged to develop and strengthen national instruments for information sharing and exchange of best practices and other mechanisms to enhance coordination and collaboration among DRR stakeholders (see ECOWAS Commission progress report, 2013).

Since most African nations are now involved in disaster risk reduction and management, we therefore ask this question: Of what significance has this effort has on African sustainable development? Using this background, our study made the first attempt to answer this question by empirically examines the effect of disaster-risk reduction management on sustainable development in African countries.

METHODOLOGY

Sources of Data

The study utilized secondary data sourced from World Bank Data Base. This was compared with data from other sources, such as ECOWAS and IMF but it was discovered that they were almost the same. This study covered the period of 2013 only because of the challenges in sourcing data for other periods and in order to use equal number of samples for the variables considered for the study. The study used seventeen African countries. The selection was based on the African countries that involved in the United Nations-sponsored Hyogo Framework for Action 2005-2015 and other countries involved in disaster risk management through their domestic agencies. The following countries were then selected for the study. The countries are Botswana, Burundi, Comoros, Cabo Verde, Malawi, Mauritius, Mozambique, Zambia, Cote D'Ivoire, Guinea-Bissau, Ghana, Madagascar, Nigeria, Senegal, Morocco, Tunisia and Kenya.

Empirical Model and Measurement of Variables

This study used Adjusted Net Savings as a measure of sustainable development in Africa. (Gnegne, 2009; Blanchet et al, 2009; and Pardi et al 2015 have used Adjusted Net savings to measure sustainable development). Sustainable Development (SD) serves as dependent variable in the model built for the study. Adjusted Net Saving (ANS) as a percentage of Gross National Income (GNI) is derived from the standard national accounting measure of gross saving by making four adjustments: (i) consumption of fixed capital is deducted to obtain net national saving; (ii) current public expenditure on education is added to account for investment in human capital; (iii) estimates of the depletion of a variety of natural resources are deducted to reflect the decline in asset values associated with extraction and depletion; (iv) deductions are made for damages from carbon dioxide and particulate emissions. The indicator is then computed by dividing ANS by GNI.

The inclusion of inflation rate as one of the explanatory variables would make sense; since ANS rate originates from the basic national income and savings calculations (See Carbonnier, Wagner & Brugger, 2011; Pardi et al, 2015).

It has been successfully proved that financial development (FIN) can impact development positively (see Ajide, 2015; Ajisafe and Ajide, 2014; Akinlo and Akinlo, 2009). Monetary effects are also presumed to be important elements that influence sustainable development (see Pardi et al, 2015). To examine the extent and effectiveness of financial intermediation on sustainable development in Africa, we included credit to private sector (as % of GDP) as a proxy for financial development in our study.

If income has positive effect on economic growth and development, it may result to increased share of transitory income in total income and thus raise the average saving rate. Therefore, in order to accommodate income in the model, we take per capita income (PCI) as a proxy for income.

We have adopted Disaster risk reduction score as a proxy for Disaster-risk management (DRM) so as to understand the effect of managing natural disaster on sustainable development in Africa. Disaster-risk reduction progress score is an average of self-disaster assessment scores, ranging from 1 to 5, submitted by countries under priority of the Hyogo framework National progress report.

Sustainable development is being affected by energy, mineral and forest depletion but this depends on the extent to which an economy depends on natural resources for generating income. Energy depletion is the product of unit resource rents and the physical quantities of energy extracted. It covers coal, crude oil, and natural gas. Mineral depletion is the product of unit resource rents and the physical quantities of minerals extracted. It refers to tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate. Net forest depletion is the product of unit resource rents and the excess of round wood harvest over natural growth. Others are Carbon dioxide damage or emitted. Particulate emission damage is the willingness to pay to avoid mortality and morbidity attributable to particulate emissions. However, most African countries depend on extractive industries to generate revenue. The portion of minerals export shares of GDP is employed in this study to reflect minerals depletion. We propose that if effectively manage through disaster-risk management programmes (DRM), it would minimize the adverse effect of this extractive activity on sustainable development. Following this background, we provide an interactive term (DRM*MNR) to capture the extent to which the extractive activities are managed so as to know its effect on sustainable development. An interaction may arise when considering the relationship among three or more variables, and describes a situation in which the simultaneous influence of two variables on a third is not additive. Most commonly, interactions are considered in the context of regression analyses (see Rajan and Zingales, 1998; Ozer-Balli and Sørensen, 2010 for more on interactive variables).

In general term, the model is therefore specified as

$$SD = f(DRM, FIN, PCI, PS, INF, DRM * MNR) \quad \text{----- (1)}$$

In econometric term, we have:

$$SD_i = \alpha_0 + \alpha_1 DRM_i + \alpha_2 FIN_i + \alpha_3 PCI_i + \alpha_4 PS_i + \alpha_5 INF_i + \alpha_6 DRM_i * MNR_i + \varepsilon_i \quad \text{-----(2)}$$

Where SD is sustainable development, FIN is financial development, PCI is per capita income, PS is the extent of political stability, INF is inflation rate, DRM*MNR is the interactive term. We expect that the coefficient of FIN, PCI, PS, INF, DRM and DRM*MNR to have positive sign. The model is estimated using Ordinary Least Square (OLS).

RESULTS AND DISCUSSION

Table 1 shows the results of the effect of disaster risk management on sustainable development in Africa using Ordinary Least Square estimation technique on cross sectional data for the year 2013. From the results, it was observed that only two variables (DRM and DRM*MNR) are significant. The result shows that a one percent increase in disaster reduction score proxy by DRM would reduce sustainable development by 4.55% on average. It can be recalled that we have adopted disaster risk reduction score as a proxy for Disaster-risk management. This shows that as African countries make an attempt to reduce the risk of disaster in the region, sustainable development improves. Hence, attention given to disaster-risk reduction is quite effective. The coefficient of the interactive term (DRM*MNR) shows that if disaster-risk management is further channeled to extractive activities that generate income to African countries, it will work effectively. This is evident as our result shows that a one-percent increase in disaster management to extractive activities in Africa such as mineral exploration and deforestation will improve sustainable development by 0.31%, on average. We need to note that socio-political and climate changes have posed an increase in the frequency of disasters across the African continents. This gives an

important policy challenge. Natural disasters cause tremendous human suffering. It can also yield substantial physical and economic damages, which may temporarily, or even permanently, jeopardize a country's overall economic development. However, as shown by the interactive variables, if proper policies are put in place and well implemented, sustainable development would improve tremendously. This implies that, we need to take the disaster risk management serious in African countries by looking at economic costs associated whenever disasters strikes.

Our results also showed that Political stability (PS) has positive relationship with sustainable development. This is well supported by Cavallo et al (2013) who observed that if radical political instability that followed disasters can be controlled; disasters cannot display any significant effect on development. Also, income (PCI) increase and financial development improve the level of sustainable development in African countries. Our result is consistent with Noy (2009) who empirically observed that countries with higher levels of domestic credit appear to withstand disasters with less spillover to GDP growth rates. Toya and Skidmore (2007) also view that as a country undergoes development, it needs to devote greater resources to safety and other pre-cautionary measures to reduce the impact of disasters.

Table 1: Estimated Effect of Disaster Risk Management on Sustainable Development

Dependent Variable	Coefficient	Standard Error	t-statistic	probability
C	12.00302	2.618411	4.584088*	0.0013
DRM	-4.55189	0.881732	-5.16244*	0.0006
FIN	0.00685	0.024631	0.278098	0.7872
PCI	0.030205	0.235438	0.128292	0.9007
PS	0.504291	0.452518	1.114409	0.294
INF	-0.053071	0.107152	-0.495281	0.6323
DRM*MNR	0.31051	0.021969	14.13395*	0.00001

R² = 0.960631 F-statistic (Probability F) = 36.60121 (0.000008) DW = 2.558488

Schwarz criterion = 5.247385 * Significant at 1%

Source: Authors' computation (2015)

The coefficient of determination (Adjusted R-square) showed that the model explains 96.1% of the dependent variable (sustainable development) leaving 3.9% unexplained. This indicates goodness of fit of the model. The F-statistic has a p-value of 0.000008. This indicates overall significance of the model.

CONCLUSION

This study examined the effect of disaster-risk management on sustainable development in Africa for the year 2013. The result showed that disaster-risk reduction is meaningful in African region both directly as it improves the level of sustainable development and indirectly when apply to mineral extraction and other sections that give income to Africa countries. The results also showed that financial development, political stability and higher income also improved the level of sustainable development in Africa which is consistent with the view of Toya and Skidmore (2007) and Noy (2009).

Despite the development of policies, plans and legislation, African countries investments in disaster risk reduction still remains low. Most African countries have limited resources to invest in disaster risk reduction and minimal fiscal space to fund relief and recovery efforts after a major disaster. Governments often lack the capacity to disaggregate specific budgetary allocations to disaster risk reduction.

This study therefore recommends that, adequate finance is essential for disaster-risk management region. Also, effective disaster management should not only directly apply to African countries, but should also be applied indirectly to areas of extractive activities in African region. The study used only 2013 as the year of study and seventeen countries were considered. This is a serious limitation to the study of this kind. Further studies in this area can incorporate more countries and expand the year of study in order to see the extent of disaster in African nations in general and Nigeria in particular.

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