

Downstream Socio-Economic Impact of Dam Failure: A Case Study of 2012 River Flooding in Benue State, Nigeria*

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ABSTRACT

The paper focused on evaluating the short and long term impacts of the 2012 flood disaster on the socio-economic sectors of Benue State. To achieve the aim of the study, Economic Commission for Latin America and Caribbean (ECLAC) methodology was employed. Results of the analysis showed that health, agriculture and business centres experienced the worst socio-economic damages among the different sectors in the area. Value of damage and losses in Health sector was N314.4 million, estimated needs for the sector was N215.1 million. In Agriculture, 32,860 livestock were destroyed during the flooding, estimated value of losses in fish production was 240.38 metric tons while in crop production, farmers lost N21.7 billion to flood disaster. In trade and commerce, 438,536 business outfits were affected and aggregate working days lost in trade and commerce was 881,400 days. It has also an enormous impact on the economic foundation of the state due to expenditure for rehabilitation and reconstruction. The paper concluded that, absence of buffer Dams contributed to the increased socio-economic impact of the disaster.

Keywords: *Flooding, Socio-economic impact, Flood prone areas, Benue State.*

INTRODUCTION

Flood strike communities around the globe each year. It is one among the ten top natural disasters in the world in terms of people affected and property damage caused (Miller, 2005). The economic cost of flood catastrophes is severe. It regularly claims over 20,000 lives per year and adversely affects around 75 million people worldwide (Smith, 1996). Generally, statistics show that flood disasters cause more significant and irreversible damage in developing countries, where the poorest and most vulnerable population groups feel the most severe impact. In the developed world, on the other hand, an increasing and significant degree of protection against disasters has been achieved over the years. Even in these countries however, damages have risen significantly as a result of greater concentration and value of socio-economic activities (ECLAC, 1991).

Some progress has been achieved in the field of planning, prevention and mitigation in Sub-Saharan Africa but large segments of the population still live in highly unstable and vulnerable conditions. Most of the countries in the region are in areas that are prone to

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hydro-meteorological and geomorphologic phenomena that have produced instance of widespread loss of human life and significant damage to physical and social infrastructure, while undermining economic performance of the region. While some areas have too little water others sometimes have too much because of natural flooding caused mostly by heavy rainfall. A flood happens when water in a drainage system overflows its normal channel and spill into the adjacent area. It occurs when peak discharge exceeds channel capacity, and this may be brought about naturally by intense rainfall, the failure of man-made structures, deforestation and urbanization which reduces infiltration and interception. According to Duru and Chibo (2014), the characteristics of the river basin (i.e the geology, soil cover, topography, vegetation and land use), the characteristics of the drainage network (i.e whether it is graded, dendritic or poorly drained) and the characteristics of the river channel (i.e if it flows through a flat plain or gorges or valley) often intensify the contribution of rainfall to flooding events.

Floodplain encroachment has serious flood risk and damage especially urban flood that occur in Nigeria are as a result of extensive rainfall, drainage blockages, dam failure and drainage morphology. Floods due to planning process for socio-economic development encroachment on to flood plain alters the integration of surface runoff with the main channel, increased surface runoff as a result of paved surface and poor drainage system. It has caused floodplain management a major concern worldwide, especially in this current rising trend of urban flooding. The situation is even more critical in cities of developing countries where there is poor control of land use practices and institutional mechanism to implement floodplain ordinances. The frequency of flooding is more common than ever due to climate change and all efforts to reduce the effects of the incidence is constantly not yielding the desired results.

Increased flood problems in the Benue State and other areas of the country have disrupted socio-economic activities and in some cases displacement of persons in affected areas. According to Adeoye, Ayanlade and Babatimehin (2009), flood bring misery to affected people. They can cause loss of life and often cause a great disruption of socio-economic activities. Water can come into people's houses, drinking water and electricity supplies may break down, roads can be blocked, and people may find it difficult to go to work, or other activities. On the whole, undesirable disaster effects may include damage to economic and social infrastructure, environmental modifications, fiscal and foreign sector imbalances, price increases, modification to demographic structures and changes in development priorities as the task of replacing lost or damaged assets results in the deferment of projects intended to overcome long-standing challenges. Deteriorating social well-being of affected people, especially among the poorest often times extend beyond the affected community through population migration, disease transmission, trade reductions or widespread environmental modifications. The floods of 2012 occurred within the flood plains of the rivers Niger, Benue and their tributaries. The Benue itself is a part of Niger River Basin and the flood events within this basin are influenced by factors operating beyond the boundaries of Nigeria (Nigeria Hydrological Services Agency, 2013). Thus, some part of Nigeria including the Benue State are hazardously placed in terms of flood

events vulnerability because the flood generating mechanisms are beyond the boundaries of one region and therefore cannot be controlled without regional agreements and cooperation. Notwithstanding, the unprecedented 2012 flooding was worst of all cases. It surpassed all flood disasters that occurred in the past in loss of life and property damages and as such there is need for understanding of floods disaster effects which is fundamental in tackling the flooding in areas susceptible to the phenomena in Benue State, Nigeria. People settle on floodplain because the many advantages including fertile soil, ample water for irrigation, availability of nearby rivers for transportation and recreation, flat land suitable for crop production and other economic activities (Miller, 2005). Floods provide the world's most productive farmland as a result of nutrient rich silt left after flood water recede, but these areas are bedeviled with natural disasters. Floodplains within the Benue valley are characterized with flood events. Increased runoff combined with heavy rainfall, has increased the severity of flooding along rivers Benue and its tributaries within the Benue state. Apart from precipitation, several other factors influence the generation of surface run off within the region which eventually leads to floods. Among the most important of these factors are: geology, land use, topography, soil characteristics, vegetation and evapotranspiration. Even with this impending danger of flood disaster, many within the region have little choice but try to survive in flood prone areas.

A disastrous flood in September, 2012 affected about twenty-seven states of the federation, covered one-third of arable land for months, killed over three hundred persons and displaced about two million people from their homes. Farmland used for crop production, mainly maize and vegetable gardening. Other crops such as sorghum, millet, groundnut, beans, yam, cassava and sweet potatoes owing to its geographical location along the banks of Rivers Benue and its distributaries were destroyed. The communities within the region have a limited capacity to control the hydrological events ensuing from the basin catchment areas. Previous studies on flooding within the area focused on causes of flooding, the health effects of flood incidence, government control and residents coping measures (Ologunorisa and Tersoo, 2006, Ocheri and Okele, 2012, Mngutyo and Ogwuche, 2013); Shabu and Tyonum, 2013). Some of the studies actually looked at the social and economic impact of flooding (Oruonye, 2012; Duru and Chibo, 2014), but there is no research work that covers the short-term and long term impact of the 2012 flooding on the socio-economic sector of the area. Therefore, it becomes necessary to examine the socio-economic impacts of flooding in the study area so as to find a lasting solution to the negative effects resulting from it.

METHOD

In this study, Economic Commission for Latin America and Caribbean (ECLAC) methodology was adopted to assess the direct and indirect impacts of flooding on the different socio-economic sectors and to identify the most affected sectors as well as the secondary effects of flood disasters. The economic commission for Latin America and Caribbean (ECLAC) method is a tool to quantify social, economic and environmental impacts of disaster assessments in Latin America and Caribbean region since the early

1970s (ECLAC, 2003). Using the ECLAC tool, social and economic information on the following were collected: loss of industrial production, loss of business production, loss of crops, damage to infrastructure, disruption of marketing systems, disruption of transport system, disruption of communication, panic and break-down of social order. The data were collected using field observation, and archival data from National emergency Management Agency (NEMA) and Benue State Emergency Management Agency (BESEMA). With a view to improving disaster response, the international community has sought to address these deficiencies over a period of many years. The United Nations Economic Commission for Latin America and the Caribbean (ECLAC) originally developed comprehensive guidelines on disaster damage and loss assessment four decades ago and has been applying them ever since in the aftermath of major disasters. These guidelines cover general concepts and methodological framework. They also include detailed guidance on the estimation of direct and indirect losses and secondary effects in areas of housing and human settlements; education and culture; health; energy; drinking water and sanitation; transport and communications; agriculture; trade and industry; tourism; the environment; and gender (ECLAC, 2003 and World Bank, 2003). This model was adopted in estimating socio-economic impact of flood disaster in the study area.

Study Area

Benue State, with a land area of 30,955 sq. km is located between Latitudes 6°25' and 8°08' N, and Longitudes 7°47' and 10°00' E, on the eastern side of the Middle Belt of Nigeria. It is surrounded by five states, namely Nassarawa to the north, Taraba to the northeast. Cross River to the south, Enugu to the south-west and Kogi to the west. There is also a short international boundary between the state and the Republic of Cameroun along Nigeria's southeast border (Figure 1). The main rivers are the Benue and Katsina-Ala. River Katsina-Ala is the largest tributary, while there are a number of smaller rivers. Extensive flood plains along these rivers are characterised by widespread swamps and ponds which are utilized for dry season irrigated farming. Elsewhere, surface drainage is generally good. Though Benue state has high drainage density, many of the streams are seasonal. As well, the permanent water table in many parts of the state is very low and there is an acute water shortage in the dry season in some LGAs. The numerous rivers and streams provide a great potential for irrigated agriculture, a source for fresh water fish and hydroelectric power and transport.

The State has a population four million, two hundred and fifty tree thousand, six hundred and forty one (4,253,641) people according to 2006 population census figures (National Population Commission, 2006). Over 75% of the population lives in the rural areas. By declaration, about 52 settlements are now treated as towns, but in reality only about 23 of these settlements have developed to a status of anything more than big villages. Makurdi, Gboko and Otukpo stand out as the biggest towns in the state. Ethnic groups consist of The Tiv (the largest group), the Idomas followed by the Igedes. Other minority groups include the Nyifon, the Afia, the Etulos and the Abakwa. Employment is as follows: 75% are farmers, 10% traders, 6% civil servants, 9% other occupations. In the rural

areas, peasant agriculture is the dominant occupation, although trading, hunting, fishing, carving and weaving also engage a good percentage of people. A handful of people are now exploring for precious stones in the rural areas. In the urban areas the civil service is the predominant employment followed by petty trading and handcraft or vocational jobs.



RESULTS AND DISCUSSION

Flood events are often accompanied by loss of lives and properties, damage to important infrastructure, disruption of socio-economic activities and in some cases demographic characteristics of affected areas. In 2012, the extraordinary flood ravaged several states in Nigeria including Benue State. Areas badly hit by the 2012 flood disaster in Benue State include: Logo, Makurdi, Gwer-west, Guma and Agatu Local Government Areas (Shabu, 2014). Table 1 show that 5 local government areas out of the 23 were affected. Within the affected local government areas, 62,303 people (8,900 household) were affected representing 5% of the total population of the affected local government areas. In the health sector, there was damages and loses. Damage are those caused to the health system infrastructure, as well as to the stock of medical equipment and inputs. Loses occur after

the event which include the reduction in the level of normally available services, the additional cost for caring for victims, including the cost of relocating services and personnel into emergency areas. Loses also include, the cost of maintaining idle human resources as a result of input on infrastructure, lost of income, vector control and so on. Table 2 shows that value of damage in the health sector in the State was N32,900,000 representing 10.5% of the total effect in the sector, while losses amounted to N281,400,000 representing 89.5% of the total effects in both private and public health sector. Estimated cost in the health sector showed that, health care delivery during and after the flood disaster was the highest cost incurred by stakeholders in the health sector.

The cost of ensuring health care services at the temporal camps was 72.3 million naira (33.6%), temporal clinics were established at the cost of 59.0 million naira (27.4%). Other costs incurred in the health sector include: reconstruction (19.1%), replacement of medical supplies (8.0%) and replacement of furniture/equipment (2.7%) (table 3 and fig. 2). Agricultural sector is the most affected sector of Benue economy. This is because most of the economic activities around/within flood prone areas are agriculture-oriented and 75% of the livelihood activities in agricultural sector. In the sector, Animals were drowned, crops destroyed, trade/commerce affected and fish production in the state affected. Table 4 shows that most of the affected animal type during the flood event was poultry (37.2%), followed by goat/sheep (37.1%). Others include, pigs (22.8%) and cattle (2.9%). Estimated value of damage and losses in the livestock is 1.163 million Naira (damage = 1.106 million naira, losses = 1.056 million naira).

Fishing activities were also affected in the area. Fishing in the natural waters was limited due to risk involved. Fish ponds/farms along the river flood plains were submerged affecting the quantity of fish produced in the areas affected by flood. Table 5 shows that, 4,267 fishing families were affected. Estimated annual fish production before the 2012 flood event was 1,414 MT and estimated fish production during flooding was 1,173.62 MT with estimated loss of 240.38 MT in fish production (17% decrease in fish production). Total estimated value of fish production loss at N8,000/MT was 1.9 million naira, indicating a decrease in the income of affected fishing families in the state.

In crop production, farmers lost 21.7 billion naira to flood disaster which adversely affected the rural economy with negative multiplier effect on Benue State economy. Trade and commerce was affected during and after 2012 flood event. Commercial outfit affected during this period include: micro-business, SMEs in manufacturing and SMEs in wholesale and retail business (table 6). Table 6 shows that the most affected commercial outfit are wholesale and retail business that were neither involved in manufacturing nor other micro-business. It is an indication that, a wholesale and retail commercial activity which is a main livelihood activity was seriously affected by the flood event. Employment and income in trade/commerce was also affected during and after the flooding (table 7). Table 7 show that, the number of people affected by the flood in terms of days lost in SMEs was 45,000 with estimated income loss of 16.9 million naira, while, in micro-trade, 836,400 were affected with estimated income loss of 557 million naira.

Table 1: Number of people affected

S/N	Status	Figure
1	Total population in 2012 (projected from 2006)	5,040,516
2	Total Number of LGAs	23
3	Total number of LGAs affected	5
4	Total population in affected LGAs	1,497,707
5	Total number of people affected in the LGAs	62,303
7	Number of affected household	8,900

Source: NEMA (2013). Nigeria Post-Disaster Needs Assessment: 2012 Floods. A Report by the Federal Government of Nigeria

Table 2: Values of Damage and losses in Health Sector ('000,000 Naira)

S/No.	Effect	Private/Public	%
1	Damages	32.9	10.5
2	Losses	281.4	89.5
3	Total	314.4	100

Source: NEMA (2013). Nigeria Post-Disaster Needs Assessment: 2012 Floods. A Report by the Federal Government of Nigeria

Table 3: estimated needs for health sector

S/N	Description	Estimated Amount ('000,000)	%
1	Cleanup/disinfection cost	1.0	<1.0
2	Temporary clinics	59.0	27.4
3	Health care	72.3	33.6
4	Prevention campaigns	0.5	<1.0
5	Reconstruction needs	41.1	19.1
6	Replacement of furniture/equipment	5.9	2.7
7	Replacement of medical supplies	17.3	8.0
	Total	215.1	100

Source: NEMA (2013). Nigeria Post-Disaster Needs Assessment: 2012 Floods. A Report by the Federal Government of Nigeria

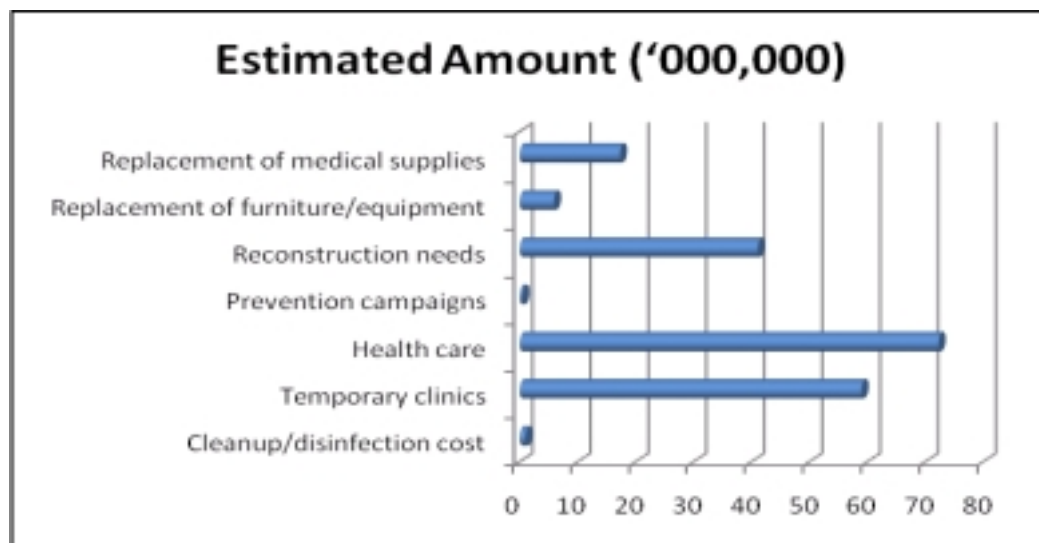


Fig. 2: Estimated Needs for Health Sector

Table 4: Flood Impact on Livestock

S/N	Animal Type	Number	%
1	Cattle	939	2.9
2	Small Ruminant (Goat/Sheep)	12,204	37.1
3	Poultry	12,207	37.2
4	Pigs	7,510	22.8
5	Total	32,860	100

Source: NEMA (2013). Nigeria Post-Disaster Needs Assessment: 2012 Floods. A Report by the Federal Government of Nigeria

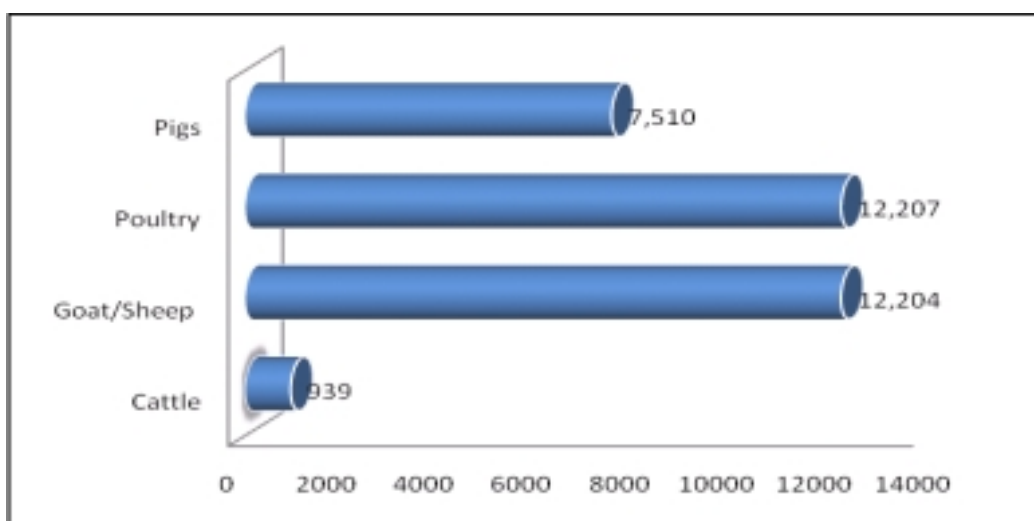


Fig. 3: Flood Impact on Livestock

Table 5: Flood impact on fish production

S/N	Effect	Number/Quantity
1	Families affected	4,267
2	Estimated average annual fish production before flooding(MT)	1,414.00
3	Estimated annual fish production during flooding (MT)	1,173.62
4	Estimated loss (MT)	240.38
5	Estimated value of loss at N8,000/MT	1,923,040

Source: NEMA (2013). Nigeria Post-Disaster Needs Assessment: 2012 Floods. A Report by the Federal Government of Nigeria

Table 6: Affected Commercial activities

S/N	Commercial Activity	Number affected	%
1	Micro-business	74	<1.0
2	SMEs in wholesale and retail	438,381	99.0
3	SMEs in manufacturing	81	<1.0
4	Total	438,536	100

Source: NEMA (2013). Nigeria Post-Disaster Needs Assessment: 2012 Floods. A Report by the Federal Government of Nigeria

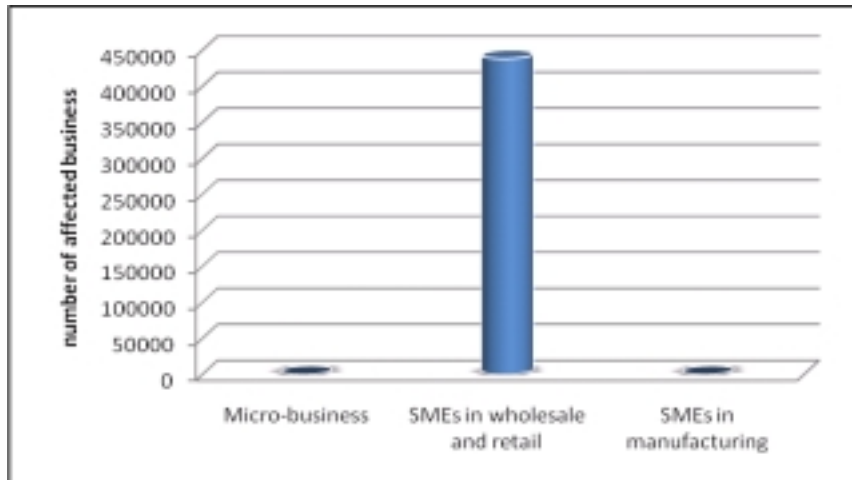


Fig. 4: Affected Commercial activities

Table 7: Impact on employment and income in commerce

S/N	Lost in employment and income	Amount/number
1	Aggregate working days lost in trade and SMEs	45,000
2	Amount lost by affected workers in SMEs ('000,000)	16.9
3	Aggregate working days lost in micro-trade	836,400
4	Income loss of micro-trade workers ('000,000)	557

Source: NEMA (2013). Nigeria Post-Disaster Needs Assessment: 2012 Floods. A Report by the Federal Government of Nigeria



Fig. 5: Affected Cement Block Industry



Fig. 6: Affected Rural Settlement



Fig. 7: Affected Urban Settlement



Fig. 8: Affected Low income Areas

CONCLUSION

The 2012 flood impact on the socio-economic sector of Benue State was unprecedented to the extent that its damage/loss is incomparable to other flood disasters that have occurred in the flooding history of the area. Agriculture, health, trade and commerce were the most affected sectors of the Benue Economy. The increase extent of this flood disaster was partly cause by lack of buffer dams that could have been used to control excess water released from lagdo dam in Cameroon and inefficient warning system that could have awaken the communities within flood prone areas to evacuate to safer areas before the disaster.

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