

AN ASSESSMENT OF SOCIO – ECONOMIC IMPACTS OF RAINSTORM AS A METEOROLOGICAL HAZARD IN LOKOJA LOCAL GOVERNMENT AREA OF KOGI STATE, NIGERIA

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#### Abstract

*Rainstorm is one of the meteorological hazards ravaging Nigeria annually. This hazard is likely to remain so unless if serious researches are conducted on it with adequate measures not only suggested, but also adopted to mitigate it. This research assessed the socio – economic impacts of rainstorm as a meteorological hazard in Lokoja Local Government Area (LGA), Kogi State, Nigeria. The aim of this research is to assess the socio – economic impacts of rainstorm which occurred on 8<sup>th</sup> May, 2011 in the study area, while the objectives include: to confirm the occurrence of rain storm in the study area, to ascertain the degree of damage done by the hazard, to assess the social impact of the havoc, to assess the economic implication of the hazard and to proffer solutions to the menace. The data used included a set of questionnaire made up of questions and options from which the victims of the rainstorm were expected to select one (1) correct option, the weather (sunshine hours, temperature, evaporation, relative humidity, cloud cover, visibility, wind direction, wind speed and rainfall) of Lokoja on 8<sup>th</sup> May, 2011 obtained from the Nigerian Meteorological Agency, Oshodi, Lagos, and the record of rain storm in Lokoja LGA on 8<sup>th</sup> May, 2011 obtained from the Lokoja LGA Emergency Management Agency. The data were presented in tables and followed with discussion. The results showed that seventeen (17) localities were affected by rainstorm with many houses blown off thereby bringing about socio - economic hardship on the victims in particular. Some general measures suggested to mitigate the effect of rainstorm include: proper building design / renovation, proper town planning and adequate weather forecast.*

Keywords: Rainstorm, Meteorological hazards, Risk, Vulnerability.

#### Introduction

Hazards are of different types, origin, magnitude and effects so they are named based on their different origins. These could be Meteorological, hydrological, chemical, industrial, technological; domestic, medical and so on. Hazards may be natural or man – made. According to the International Agency for Disaster Reduction (ISDR, 2004) a hazard is a potentially damaging event, phenomenon or activity that may cause a disaster, leading to injury, loss of life, damage, social or economic disruption or environmental degradation. Also, one hazard may lead to other hazards. The risk (probability) of a disaster occurring results from the interaction between the probability of a given hazard occurring and the degree of susceptibility of a landscape to the hazard. The susceptibility of disaster comprises the inherent vulnerability of our environment, our society and our economy, and is mitigated by the capacity to cope, withstand and recover from the impacts of a hazard (ISDR, 2004). It should however be noted that hazards affect man both directly and indirectly and in most cases, the effects which manifest almost immediately may last for either short, medium or long period of time.

The ISDR (2004) defines Risk (R) as a function of Hazard (H), Vulnerability (V) and Capacity (C), quantified as:

Risk (R) = Hazard (H) x Vulnerability (V) / Capacity (C).

This therefore implies that, risk is prevalent when hazard occurs and it makes an environment, including man to be vulnerable. Vulnerability according to ISDR (2004) is a set of conditions and processes resulting from physical, social, economical and environmental factors, which increase the susceptibility of a community to the impact of hazards. Capacity on the other hand is a combination of all the strengths and resources available within a community or organization or that can reduce the level of risk or the effects of a disaster (ISDR, 2004). Meteorological hazards are those natural disasters associated with weather and climate. These include tropical storms, hurricanes, cyclones and typhoons.

A tropical cyclone is a non – frontal storm system that is characterized by a low pressure centre, spiral rain bands and strong winds. Usually, it originates over tropical or sub tropical waters. The system is fuel by heat released when moist air rises and the water vapour it contains condenses (“warm core” storm system). Therefore, the water temperature must be  $> 27^{\circ}\text{C}$  (Ayoadé, 1988). Nieuwolt (1977) observed that tropical cyclones are characterized by almost circular isobars around a centre of very low pressure, normally around 950 mbar at sea level. Nieuwolt (1977) also observed that rainstorms, which are relatively short periods of uninterrupted and intense rainfall, are an interesting feature of the tropical climate and can do extensive damage.

Rainstorm which is weather - related affects man adversely whenever it occurs causing physical injury on houses and trees, psychological trauma, economic losses, unforeseen or unbudgeted expenditure on the part of the government and individuals as well as the public and financial embarrassments to the victims. Storms are regular feature of our weather system in Nigeria as there is hardly any year that disaster caused by rainstorm is not reported across the country. For instance, NEMA (2010) stated that in Abia state, 180 houses and other properties were destroyed by windstorm; in Adamawa state, 1,562 families were displaced and properties destroyed by windstorm; 1,010 persons displaced in Anambra state by flood and windstorm; in Benue state flood and rainstorm displaced people, schools, buildings and properties were also destroyed, economic trees destroyed and 119 people displaced; in Cross River state, 1132 persons were displaced with 383 houses destroyed by flood, landslide, windstorm and fire; in Delta state, flood and windstorm destroyed 500 houses and displaced 1225 persons; in Enugu, 480 houses were affected and 231 families displaced by windstorm; in Kano, windstorm displaced 478 persons and destroyed properties; in Kwara state, fire / rainstorm displaced 9,000 people and destroyed properties; while in Yobe state, 800 households were displaced and properties destroyed by wind / rainstorm. Although, records of rain storm in Lokoja LGA, Kogi State is very scanty. The only one available for 8<sup>th</sup> May, 2011 shows a very catastrophic experience. It is in the light of this that this research has become necessary.

#### Aim and Objectives of the Study

The aim of this research is to assess the socio – economic impacts of rainstorm on 8<sup>th</sup> May, 2011 in Lokoja Local Government Area (LGA) of Kogi States, while the objectives include:

- (i) to confirm the occurrence of rain storm in the study area,
- (ii) to ascertain the degree of damage done by the hazard,
- (iii) to assess the social impact of the havoc,
- (iv) to assess the economic implication of the hazard and
- (v) to proffer solutions to the menace.

#### Description and Geographical Location of the Study Area

The study area, Lokoja Local Government Area is located between longitudes  $6^{\circ} - 7^{\circ}$  east and latitudes  $7^{\circ}14' - 9^{\circ}$  north. Lokoja derived its name from two (2) Hausa words, a tree and a colour. “Loko”, which means “Iroko” and “ja”, which means red. So, the name Lokoja means, Red Iroko (tree). Kogi is also a Hausa word which means a flowing river (Kogi Local Government Area

brochure, 1993 cited in Audu, 2001). Lokoja is the administrative capital of Kogi state and the confluence town of not only Kogi state, but also Nigeria. Lokoja LGA enjoys both wet and dry seasons with the total annual rainfall between 804.5mm – 1767.1mm, range is about 962.6mm while mean is about 1216.86mm (Audu, 2012c). Mean annual temperature is about 28.03°C (Audu, 2012d) and a relative humidity of 30% in the dry season and 70% in the wet season (Audu, 2001; Yusuf and Agabe, 2010). Average daily wind speed is 89.9 km/hr. Wind speed is usually at its peak in March and April. The average daily vapour pressure is 26 Hpa (Kogi state statistical year book, 1997 cited in Audu, 2001). The most important hydro – geological feature at Lokoja is the River Niger and the confluence of Rivers Niger and Benue (Kogi LGA brochure, 1993 cited in Audu, 2001). At Lokoja, there is a wide flood plain along the lower Niger, which is more than 1,600m wide. The relief rises from about 300m along the Niger valley to between 300 – 900m above sea level in the uplands (Ajibade, 1993 cited in Audu, 2001; Yusuf and Agabe, 2010). The rocks fall within the Precambrian age as well as the various sedimentary rocks. The study area is found in Guinea Savanna with the presence of gallery forest along water courses (Iloeje, 1976 cited in Audu, 2001, Yusuf and Agabe, 2010). The dominant primary activities in the study area are fishing, farming, trading, hunting with low percentage of tertiary activities (Yusuf and Agabe, 2010). The area is another tourist haven in Nigeria, but only little attention is paid to this at present. The major means of transportation is by road. Although, the largest river in Nigeria is found here; but under – utilized for transportation. Due to the hilly nature of the area, cable car is also another possible means of transportation.

In terms of population, the study area had a total population of 82, 483 in 1991 (NPC, 1991), while in 2006, the population stood at 196,643 (National Population Commission, 2006). Between 1991 and 2006, the study area observed an increase in population of 114, 160. The implication of this change in population on the study is that the gallery forest along River Niger which hitherto served as a wind break has been destroyed by man so also are other areas with trees. The study area comprises of many indigenous ethnic groups such as the Hausa, Egburra, Nupe, Kupa, Kakanda, Ganagana, Oworo and Bassa.

#### Materials and Method

The data used included a set of questionnaire made up of questions and options from which the victims of rainstorm of 8<sup>th</sup> May, 2011 were expected to select one (1) correct option; the weather (sunshine hours, temperature, evaporation, relative humidity, cloud cover, visibility, wind direction, wind speed and rainfall) of Lokoja on 8<sup>th</sup> May, 2011 obtained from the Nigerian Meteorological Agency, Oshodi, Lagos, and the only available record of rain storm in Lokoja LGA on 8<sup>th</sup> May, 2011 obtained from the Lokoja LGA Emergency Management Agency. The data were presented in tables and followed with discussion. Victims who could not read, speak and write in English language were assisted in local languages especially Hausa. The results are presented in tables and followed with discussion.

#### Results and Discussion

Table 1 shows the weather variables of Lokoja LGA on 8<sup>th</sup> May, 2011.

Table 1: Weather of Lokoja LGA on 8<sup>th</sup> May, 2011.

S / N	Weather Variable	Value / Description
1	Sunshine hours	8.0
2	Temperature	36 <sup>o</sup> c
3	Evaporation (Pitch)	4.9ml
4	Relative humidity	70%
5	Cloud cover	7.0 Oktas
6	Visibility	18km
7	Wind direction	South - Easterly
8	Wind Speed	160/06
9	Rainfall	11.0mm

Source: Nigeria Meteorological Agency, Oshodi, Lagos (2013).

From table 1, the sunshine hours are sufficient enough to give rise to the high temperature of 36<sup>o</sup>c for the day. The high temperature also gave rise to the high evaporation and consequently, high relative humidity and cloud cover. The high cloud cover and relative humidity resulted in the rainfall of 11.0mm. The wind direction of south – easterly is moisture laden, whereas the wind speed is 160km / hour with 6 knots. As described by Areola, *et al* (2002) wind having 6 knots is a strong breeze which makes large branches to be in motion with whistling heard in telegraph wire. The high wind speed was responsible for the damage of roofs while, the amount of rainfall recorded was responsible for the damages of household items recorded (table 2). Table 2 shows the localities affected by rainstorm of Sunday, 8<sup>th</sup> May, 2011 in Lokoja LGA of Kogi State.

Table 2: Record of Rainstorm in Lokoja LGA Kogi State on 8<sup>th</sup> May, 2011.

S/N	Name of Locality	No of Victims	Items Destroyed
1	Felele	18.0	10 roofs completely blown off, 8 roofs partially blown off, mattresses, books, ceilings and electronics.
2	Agbaja	9.0	7 roofs completely blown off, while 2 were partially affected, mattresses, pillows and food stuffs
3	Tajimi – Oworo	1.0	1 roof blown off completely and crops
4	Lokoja	52.0	48 roofs were partially blown off, while 4 roofs completely damaged including the walls, documents, books, rugs, ceilings, mattresses, furniture and electronics.
5	Otokiti Estate	1.0	Roof blown off partially, ceilings and electronics
6	Akpanyan - Oworo	1.0	Roof totally blown off, crops and 3 fowls
7	Crossa – Oworo	1.0	Roof totally blown off, mattress and foodstuffs
8	Gada Biu – Crossa	1.0	Roof totally blown off, mattress and a goat killed

9	Kungbani	1.0	Roof removed completely, wall partially damaged and mattress
10	Gbaude – Oworo	7.0	5 roofs blown off completely, 2 roofs partially blown off, crops and fous
11	Magajiya	1.0	Roof totally blown off, mattress and crops
12	Oshokoshoko	1.0	Roof partially blown off, electronics and mattress
13	Ijiho - Oworo	2.0	Roofs partially blown off, electronics and a mattress
14	Irimi – Oworo	1.0	Roof partially blown off and crops
15	Otube – Oworo	1.0	Roof partially blown off and crops
16	Ogbabon – Oworo	1.0	Roof partially blown off and crops
17	Crossa Bridge – Oworo	1.0	Roof partially blown off and crops
Total		100	

Source: Lokoja Local Government Emergency Management Agency and Field Study (2011).

Table 2 has confirmed the occurrence of rainstorm in the study area. A total of seventeen (17) communities were seriously hit by a very strong rainstorm, while a total of one hundred (100) victims were recorded on 8<sup>th</sup> May, 2011 alone. Lokoja town was worse hit with fifty – two (52) victims. Lokoja is an ancient town founded by the colonial masters hence it is called “Garin Bature” in Hausa language. Kabawa, Mahuta, Adankolo, Ungwan Rimi, Ungwan Hamza (Sarki), Ungwan Masara, Makera, Ungwan Yashi, Sarkin Noma, Madabo and Lokogoma were affected by the rainstorm. In these areas, roofs of the affected houses were either completely or partially blown off with several household items destroyed such as mattresses, pillows, clothes, electronics, hand sets, wall clocks, carpets/rugs, electrical gadgets, foodstuffs, crops, domestic animals, documents and so on (table 2). Raheem (2010) opined that rainstorms and flooding in Ilorin have made Ilorin one of the most vulnerable cities in Nigeria in the recent past not only because the number of such incidents has increased in the last few years, but also because the severity has translated into extensive damage to properties and livelihoods of the people. electronics, mattresses and rugs destroyed. Ejiofor, (2011) also stated that windstorms occur all over Nigeria especially in the North periodically causing ecological disasters of catastrophic proportion as buildings are usually destroyed, lives lost, farmlands and produce damaged and many people rendered homeless. Felele a satellite town to Lokoja was not spared by rainstorm on the said day. Other localities affected by the rainstorm on the said day are rural with few houses and very low population. This made the number of victims to be very low. This scenario eventually turned the victims into environmental refugees as some of them had to squat with relations and neighbours for days or weeks (table 3).

Table 3: Days spent outside home by victims due to rainstorm of 8th May, 2011 in Lokoja LGA, Kogi State

S/N	Days	Frequency	% of frequency
1	Nil	50	50.0
2	1 – 5	38	38.0
3	6 – 10	08	8.0
4	11 – 15	03	3.0
5	16 – 20	01	1.0
6	21 – 30	Nil	0.0
7	30 and above	Nil	0.0
Total		100	100

Source: Authors' field study (2011)

Whenever roofs of houses are blown off, the victims are vulnerable to physical injuries and other health issues such as cold, catarrh, pneumonia and malaria fever due to exposure and other environmental problems. Also, the socio – economic life of the victims are affected as the victims and / or their relations rally round to see that the blown – off roofs are put in place thereby increasing their economic hardship. In most cases, the roofing materials (zincs, nails and planks) were badly damaged that they had to be completely replaced thereby leading to high cost of re – roofing. The cost of replacing the blown off roofs varied due to the location (either urban or rural), severity, type of materials to be used and size of building among others. Table 4 shows the costs of re – roofing the blown off roofs in the study area.

Table 4: Cost of Re – roofing the blown off Houses in Lokoja LGA, Kogi State following Rainstorm of 8<sup>th</sup> May, 2011

S/N	Cost (#)	Frequency
1	1000 – 10, 000	05
2	11, 000 – 20, 000	07
3	21, 000 – 30, 000	34
4	31, 000 – 40, 000	10
5	41, 000 – 50, 000	0
6	51, 000 – 60, 000	11
7	61, 000 – 70, 000	0
8	71, 000 – 80, 000	01
9	81, 000 – 90, 000	0
10	91, 000 – 100, 000	06
11	101, 000 – 110, 000	08
12	111, 000 – 120, 000	0
13	121, 000 – 130, 000	01
14	131, 000 – 140, 000	0
15	141, 000 – 150, 000	05
16	151, 000 – 160, 000	0
17	161, 000 – 170, 000	0
18	171, 000 – 180, 000	0
19	181, 000 – 190, 000	0
20	191, 000 – 200, 000	02
21	200, 000 and above	10
Total		100

Source: Authors' field study (2011)

The above amounts reflect the costs of buying roofing materials like bundles of zincs, nails, ceilings, planks, loads of sand and to pay labourers among others. From table 4, it could be seen that huge amount of money was spent by the victims of rainstorm on the said day under study. The implication is that, poverty level was increased as some of the victims are civil servants earning just little amount of money monthly and saddled with other responsibilities for the family like the provision of food, clothing, education and health among others. Their businesses were also disrupted.

#### Conclusion

It is now important for people to take bold steps in averting rainstorm because of its socio – economic impacts on their lives such as economic, psychological, social, religious, educational and emotional among others because when rainstorm occurs, even the material and financial aids provided by government, individuals and other non – governmental organizations for the victims either delay, do not get to them as expected or do not get to them at all while the victims are left battling with the effects of the disaster.

#### Recommendations

From the fore – going therefore, it is clear that rainstorm is a hazard and it's risky. In order to mitigate the effect of rainstorm in the study area there should be proper building design / renovation. Building code should be strictly adhered to likewise regular maintenance of buildings. Further, proper town planning should be enforced in the area. In addition, proper and regular weather fore – cast should be adopted to predict the timing, magnitude and direction of movement of storms generally. This would assist both the Government and individuals to prepare adequately.

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