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IMPACT OF URBAN FLOODING ON SMALL AND MEDIUM SCALE BUSINESSES IN BENIN CITY, EDO STATE, NIGERIA

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Abstract

The study aimed to investigate the impact of urban flooding on small and medium scale businesses in Benin City. Ten locations including, BDPA quarter, Urelu market, Oliha market, Ekenwan quarter, Ogida quarter, Urelu market, New Benin, Ikpoba Hill, Aduwawa, Upper Sakponba were purposively selected for the study due to previous flood experience. Using a stratified random sampling technique, houses to be sampled were selected and only business owners were qualified for the study. A total of 500 questionnaires were administered, in 10 quarters, 50 questionnaires per quarter. Analysis of flood impact on business type showed that Small farm operators recorded 76.95%, commercial taxi/tricycle operators, 77.85%, food vendors, 79.79%, automobile repairers 76.85%, kiosk operators, 81.87%, fruits sellers, 85.1%, carpentry/furniture, 78.9% and hair dressers/barbing saloons, 87.23% being the worst impact. Analysis of variance at 0.05 statistical threshold showed that the observed impact of urban flooding on small and medium businesses in Benin City differ statistically. Greatest impact was observed by hair dressers while least impact was witnessed by automobile repairers. In terms of nature of impact, access problem to costumers accounted for 88.6%, operational disruption (82.12%), access problem to employees 50.25%, business closure, 41.63%, damage to farm land, 62.27%, damage to stock, 78.5%, supply chain disruption, 69.08% and damage to inside building, 62.05%. There was a general belief among owners of businesses that government is responsible for managing the flood risk and implementing adequate mitigation actions and therefore no individual action was required. Lack of finance was attributed to the under insurance of their businesses. Many businesses were skeptical about the probability of flooding as well as the losses that flooding may cause to their businesses. The tests for statistical variations in flood impacts between locations using one-way ANOVA shows that flood impacts on business types differ significantly at 0.05 level of confidence. In terms of spatial dimension of impact, analysis shows that all the sample locations have similarly experienced various degree urban flood impacts in terms of disruptions of business activities. The study recommends awareness in particular to control the practice of dumping solid waste into waterways. Flood zoning ordinances and land use control acts should also be enacted and enforced by the state government which will specify flood risk areas.

Keyword: Benin City, flood control, flood impact, small and medium scale businesses, Urban flooding

Introduction

In many parts of the world, flooding is the leading cause of losses from natural phenomena and is responsible for a greater number of damaging events than any other type of natural hazard (Smith, 1996; Kron, 2005), yet, floods seem to be part of the lives of most communities in the world particularly in developing countries. In Nigeria, the pattern is similar with the rest of the world. Flood is one major environmental problem seriously affecting the cities and villages in recent times causing damage to property and loss of lives in the country (Ologunorisa, 2004; Ali, 2005; Ologunorisa and Tersoo, 2006; Obeta, 2010). There is increasing vulnerability of populations and infrastructure to flooding and flood related hazards. Flood hazards are natural phenomena, but damage and losses from floods are usually, the consequence of human action (Doocy, *et al.*, 2013). Unlike other forms of flood, urban flood refers to the inundation of sections of urban areas which can be caused by a combination of high intensity rainfall and prolong rainfall leading to the development of flash floods (Gobo and Abam 1991). Urbanization aggravates flooding by restricting where flood water flows into. Covering large parts of the ground with roofs, roads and pavements, obstruct sections of the natural channels and drains that ensure that water moves to rivers faster than it did under natural conditions. As an area become “urbanized” or go through the process of urbanization, there are increased flood risks that result due to human activities such as deforestation, building without plan and so on (Aderoju *et al.*, 2014; Otomofa *et al.*, 2015). As a result, even quite moderate storms produce high flows in rivers because there are more hard surfaces than drains. In the last 50 years, Benin City has witnessed a tremendous growth in population and area coverage. A prominent environmental problem associated with this expansion is flooding.

Flooding affects numerous aspects of man’s environment. These include his economic activities; settlements and lifestyle. Several threats to livelihoods ranging from the physical threats to social and economic threats exist, while affected persons suffer some psychological effects. Economic measurements are difficult but they are much easier to make than estimating the disaster’s impacts on the emotional and social structures (West and Lenze, 1994). Studies have also attempts to quantify the lasting post-traumatic stress syndrome on individuals in disaster-impacted communities (Tobin and Ollenburger, 1996, Erickson, 1998). A study of suicide rates before and after disasters indicated that suicide rates rose 13.8 percent in the four years after floods (Krug, *et. al*, 1998). Olajuyigbe *et al* (2012) observed that flooding events are usually not limited to destruction of physical structures but are also accompanied with prevalence of diarrhea and other waterborne diseases as most sources of water are polluted.

Know Risk (2005) observed that the economic impact of natural disaster shows a marked upward trend over the last several decades. The hazards tend to hit communities in developing countries especially the developed countries, increasing their vulnerability and setting back their economic and social growth sometimes by decades. The floods have led to loss of human life, destruction of social and economic infrastructure and degradation of already fragile ecosystems.

Small and Medium scale businesses have been found to be highly vulnerable to flooding and other natural hazards due to their inherent characteristics (Ingirige *et al.*, 2008, Crichton, 2006). The impacts may have either directly or indirectly through damaged or lost stock, damage to building / premises, damaged or lost building equipment, inability to conduct business, and inconvenience to staff. Climate Ready (2015) identifies that the 2012–2013 flooding in the UK resulted in losses to businesses to the value of £200m, with companies facing up to £84m in property and contents damage, up to £33m in related economic costs

(such as lost working days), and a further £82m of costs relating to infrastructure disruption. The flood events caused significant disruptions to the business sector, especially small and medium-sized businesses (SMEs), which are often affected disproportionately hard by such events and are less prepared to manage the consequences (Crichton, 2006; Bmg Research, 2011). In Nigeria, while several studies have been undertaken to assess the environmental and socioeconomic impacts of urban flooding little attention has been given to impact of flooding on small and medium scale business and coping strategies (Otomofa *et al.*, 2015; Olajuyigbe, *et al.*, 2012; Aladelokun and Ajayi, 2014). This is in spite of increasing evidence of changing climatic pattern. This study therefore attempts to evaluate the impacts of urban flooding on business types and coping methods in Benin City.

Materials and Methods

Description of Study area

The study area is Benin City, which is the capital of Edo State of Nigeria, in West Africa. Its location is within latitude 6°14'N and 6°21' N of the equator and longitude 5°35' E and 5°44' E of the Greenwich Meridian. The area is put at 1125 square kilometres approximately. Benin City is bounded in the east by Orhionwon LGA, to the west by Ovia North East LGA, to the north by Uhumwonde LGA and to the south by Delta State. Benin City cuts across three or four Local Government Areas (LGAs) namely Oredo, Egor, Ikpoba-Okha and to some extent, the Ekosodin axis of ovia Northern East bordering the University of Benin. Benin City is characterized by a maze of drainage system. The major rivers are the Ikpoba, Ovia, Okhuahie Rivers and a maze of distributaries and streams. The topography is generally flat with most areas below 185 metres above sea level. The inhabitants of Benin Metropolis are Multi-ethnic although the Binis are the dominant ethnic group. Others are the Ishans, Hausas, Ibos, Yorubas, Urhobos, Itsekiris, Ijaws etc. This is largely due to its easy access to other parts of the country which has led to a rapid increase of its population.

Data collection

Both field work, primary and secondary data were used for the study. Primary data was obtained through the administration of structured questionnaires and utilization of oral interviews where necessary. Questionnaires made up of 34 structured close and open ended questions were distributed to respondents. The questions cover socio-economic status, impacts of flooding on business and socioeconomic activities. Purposive sampling method was adopted in the study to generate information on consequences of flood by flood prone business owners. McMillan and Schumacher (1997) describe purposive sampling as “selecting information-rich cases for study in-depth” when one wants to understand something about those cases without needing or desiring to generalize to all cases.

In this technique, the researcher chooses the sample based on appropriateness for the study. The choice of this method is based on the fact that sample units have particular features or characteristics which will enable detailed exploration and understanding of the central themes and puzzles which the researcher wishes to study” (Ritchie *et al.*, 2003). Locations were sought where there had been significant flooding, so that those interviewed would have been affected by flooding or were likely to have some awareness of the event in what might be considered their ‘local community’. Flood prone areas were identified during the rainy season/flooding period. The areas utilized for this study are flood endemic streets including BDPA quarter, Uselu market, Oliha market, Ekenwan quarter, Ogida quarter, Uwelu market, New Benin, Ikpoba Hill, Aduwawa, Upper Sakponba. Business owners that annually experience flooding and still reside in these quarters were selected for the study.

Using a stratified random sampling technique 500 houses to be sampled were selected and only business owners were used for the study. A total of 500 questionnaires were administered, 50 questionnaires per sample location. Of this quantity, 424 questionnaires were responded to and retrieved from respondents. In addition, a five-point Likert-type scale was adopted. Studies have shown that *Likert scales* can indeed be analyzed effectively as interval scales (Baggaley & Hull, 1983; Maurer & Pierce, 1998; Vickers, 1999).

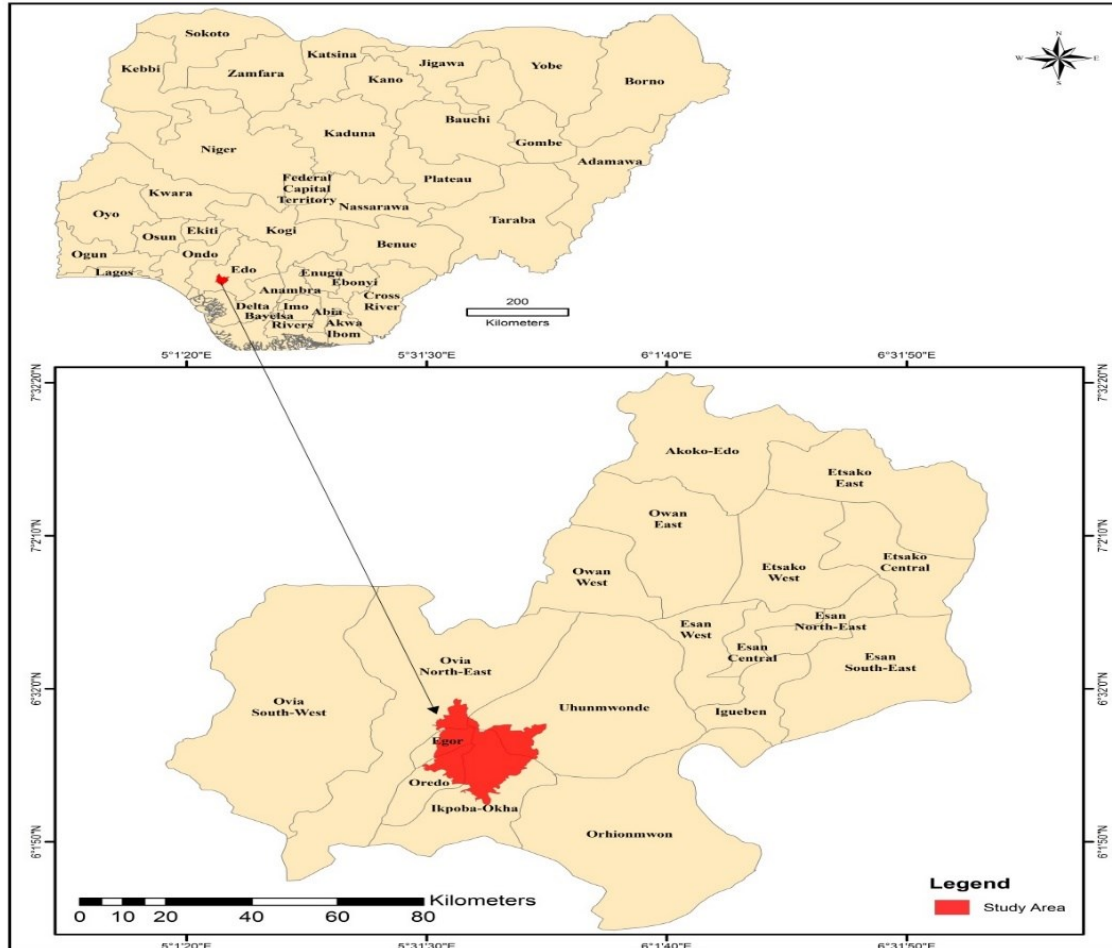


Figure 1: Edo State Showing Benin City, the study area.

Source: modified from Ministry of Lands and Survey 2014

Data Analysis

Data collected from the field were subjected to various parametric statistical analyses. To determine the extent of spatial variation in business and socioeconomic effects of flooding, a one way single factor Analysis of Variance (ANOVA) was utilized at 0.05 level of significance. All quantitative statistics were performed using Statistical Package for Social Science (SPSS) Version 16.0. Findings were presented in tables and graphs.

Results and Discussion

From the findings, 142 (33.5%) of the sampled business owner revealed that floods impacts on their business activities, 122(28.7%) agreed, 60 (14.2%) were neutral on the impact of flooding, 58 (13.7%) disagreed and 42 (9.9%) revealed that flooding does not affect their business (Table 1). Table 2 summarizes the percentage of urban flood impact on business types in the Benin City. Small farm operators recorded 76.95%, commercial taxi/tricycle operators (77.85%), food vendors (79.79%), automobile repairers (76.85%), kiosk operators (81.87%), fruits sellers (85.1%) carpentry/furniture (78.9%) and hair dressers/barbing saloons (87.23%) being the worst impact by urban flooding.

Table 1: Frequency of flood impact on small scale and medium scale business activities in Benin City

Response	Frequency	Percent %
Strongly agree	142	33.5
Agree	122	28.7
Neutral	60	14.2
Disagree	58	13.7
Strongly disagree	42	9.9
Total	424	100.0

Table 2: Impact of Urban Flooding on Business type in Benin City (%)

Location	Small and medium Business Type							
	Small farm operators	Commercial taxi/tricycle operators	Food Vendors	Automobile Repairs	Kiosk Operators	Fruit sellers	Carpentry/ Furniture'	Hair dressing/ barbing saloon
BDPA quarters	5.18%	7.4%	4.7%	7.67%	5.9%	5.24%	3.09%	3.4%
Uselu market	8.96%	5.27%	3.9%	9.11%	8.8%	7.2%	6.18%	10.04%
Oliha Market	4.24%	4.79%	3.4%	4.83%	6.92%	5.16%	7.98%	7.72%
Ekenwan quarters	9.9%	13.9%	5.78%	6.75%	12.4%	6.41%	6.62%	12.4%
Ogida quarters	9.26%	9.59%	7.1%	11.9%	8.17%	12.24%	13.4%	8.96%
Uwelu Market	6.6%	8.74%	12.6%	4.3%	7.63%	10.78%	4.6%	6.93%
New Benin Market	2.83%	6.7%	13.4%	7.9%	11.2%	8.07%	8.76%	12.2%
Ogbeson quarter (Ikpoba Hill)	6.98%	9.27%	8.4%	6.38%	7.15%	6.12%	15.2%	7.89%
Aduwawa quarters	13.67%	7%	7.36%	5.07%	9.3%	9.6%	5.65%	6.45%
Upper Sakpomba	9.33%	4.89%	13.15%	12.94%	4.4%	14.28%	7.4%	11.24%
Total	76.95%	77.55%	79.79%	76.85%	81.87%	85.1%	78.88%	87.23%

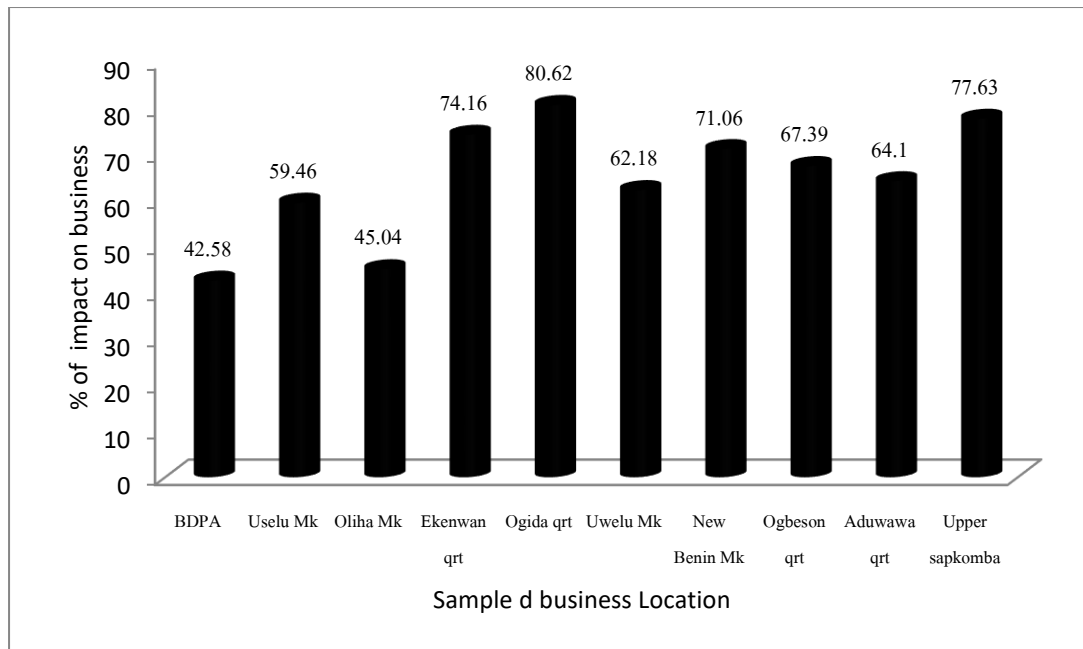


Fig. 2: Impact of urban flooding on small and medium scale business location in Benin City

Fig. 2 shows that highest impact was experienced by owners of small and medium scale businesses in Ogida quarters, followed by owners in upper Sakponba quarters. Least impact was experienced by business operators in BDPA quarters, Ogbowo. This low level of impact may be attributed to educational level of business owner of business in BDPA which houses of 40% of staff and student of the University of Benin. The high level of impact on businesses in Ogida and upper Sakponba quarters may be attributed to the deplorable states of infrastructural facility in these quarters which are as old as the City.

Table 3: Analysis of Variance of impact of urban flooding on business types in Benin City

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	25.06656	7	3.580937	0.235231	0.975251	2.139656
Within Groups	1096.062	72	15.22309			
Total	1121.129	79				

Table 4: Analysis of Variance of impact of urban flooding on sample business locations in Benin City

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	289.4526	9	32.1614	2.70694	0.009163	2.016601
Within Groups	831.6764	70	11.88109			
Total	1121.129	79				

Tables 3 and 4 represent the statistical relationship between flood impact on business types and between locations. Findings in table 3 show that our initial hypothesis that impact of urban flood on business types does not differ significantly was rejected. This suggests that the

impact of urban flooding on small and medium businesses in Benin City differ statistically at 0.05 statistical thresholds. Greatest impact was observed by hair dressers while least impact was witnessed by automobile repairers. In Table 4, our initial hypothesis that flood impacts do not differ significantly according to location was accepted at 0.05 level of significant, implying that all the sample location have similarly experienced various degree urban flood impacts in terms of disruption of business activities.

Table 5: Nature of urban flood impacts on business types in Benin City

Location	Nature of urban flood Impact							
	Access problem to customers	Operational Disruption	Access problem to employee	Business closure	Damage to farm land	Damage to stock	Supply chain disruption	Damage to inside building
BDPA quarters	6.46	5.54	9.57	2.97	5.94	3.96	4.14	5.18
Uselu market	15.6	12.6	6.6	0.6	2.7	12.6	5.3	3.2
Oliha Market	6.59	5.6	5.9	1.32	3.9	9.6	8.27	2.9
Ekenwan quarters	9.45	14.1	4.6	11.49	9.19	8.33	6.78	4.7
Ogida quarters	7.4	4.9	1.98	9.15	10.14	3.9	12.6	11.6
Uwelu Market	14.2	5.9	5.79	2.74	1.21	3.4	4.3	5.5
New Benin Market	6.87	12.5	2.67	0.76	2.29	6.03	6.4	8.01
Ogbeson quarter (Ikpoba Hill)	6.44	5.18	4.07	6.29	4.44	12.59	8.5	2.22
Aduwawa quarters	7.58	6.1	6.2	3.79	12.75	6.55	6.89	7.24
Upper Sakpomba	8.02	9.7	2.87	2.52	9.71	11.5	5.9	11.5
Total	88.61	82.12	50.25	41.63	62.27	78.46	69.08	62.05

In table 5, the nature of flood impacts on business activities are summarized. Highest impact on business activities was through access problem to costumers accounting for 88.6%, operational disruption (82.12%), access problem to employees (50.25%), business closure (41.63%), damage to farm land (62.27%), damage to stock (78.5%), supply chain disruption (69.08%) and damage to inside building (62.05%). The analysis of variation results in table 6 shows that our initial hypothesis that the nature of flood impact on business types does not differ significantly was rejected at 0.05 statistical threshold. This suggests that flood impact on businesses varied significantly. Access problem to customers recorded the highest impact type with business closure being the least impact type.

Table 6: ANOVA of nature impact of urban flooding on business types in Benin City

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	655.2897	7	93.61281	0.263507	0.966184	2.126324
Within Groups	28420.6	80	355.2575			
Total	29075.89	87				

Table 7 summarizes the current flood management measures undertaken by small and medium scale business owners in Benin City. Reliance on community flood prevention option ranked highest with percentage rate of 21.8%. This was followed by structural adjustment, including creating water barrier, clearing of waterways, roof protection; raising the ground level etc. For those that practice structural adjustment previous and repeated flooding experience was the driving force.

Table. 7: Flood control measures used by business owners

Flood control measure	Frequency	Percentage (%)
Alternative location	12	5.5
Business Insurance	4	1.8
Emergency Plan	18	8.2
Reliance on Govt intervention	37	16.8
Reliance on community intervention	48	21.8
Structural Adjustment	39	17.7
Change of Business	18	8.2
Regular Repair/maintenance	44	20
	220	100

Reliance on government also featured as a common flood management measure in Benin City. There was a general belief among owners of businesses that government is responsible for managing the flood risk and implementing adequate mitigation actions and therefore no individual action was required. Business insurance ranked the least flood control measure used by small and medium scale business owners in Benin City. Lack of finance was attributed to the under insurance of their businesses. Many businesses were skeptical about the probability of flooding as well as the losses that flooding may cause to their businesses. The general perceptions that alternative location, insurance, emergency plane and change of business are expensive or not usually beyond the scope of business plan hinder flood management practices by most small and medium scale business owners. Some businesses were of the view that they would still be able to continue their business uninterrupted even if the business premises were flooded. This has resulted to low implementation of protection measures.

Conclusion and Recommendations

The study found that small and medium scale businesses are highly vulnerable to urban flooding. The perceptions that alternative location, insurance, emergency plan and change of business are expensive and sometimes not the responsibility of business owners in the case of

rented building was found to be major limitations to flood management practices by small and medium scale business owners. In spite the recurring nature of the impact, little or no efforts are undertaken by business owners to ensure their businesses against flood; instead, reliance on community and government interventions was common control measures. Many business owners were not sure about the probability of flooding as well as the losses that flooding may cause to their businesses, which explains the low level of emergency plan by business owners in Benin City.

In the light of the findings, the study recommends a well-planned drainage system which can accommodate the localized heavy rains in the metropolis to be put in place by both the state and local governments. Already the Edo State Ministry of Environment and Public Utilities has embarked on watershed management, this project may not have taken into account the role of public sensitization on flood management. Dumping of solid waste into waterways was observed as a common practice in locations investigated. Flood zoning ordinances and land use control acts should be enacted and enforced by the state government to specify flood risk areas.

References

- Aderoju O.M, Jantiku J, Fagbemiro O.A, Aliyu I, Nwadike B.K, Ajonye S.E, Salman K.S (2014): Geospatial Assessment of 2012 Flood Disaster in Kogi State, Nigeria. IOSR. *Journal of Environmental Science, Toxicology and Food Technology* Vol 8 (2) 74-84.
- Aladelokun A. O, Ajayi C. F (2014): An Appraisal of the Socio-Economic Impacts of Urban Flood in Ado – Ekiti Metropolis in Ekiti State *International Journal of Asian Social Science*, 2014, 4(10): 1027-1034
- Baggaley, A., and Hull, A. (1983): The effect of nonlinear transformations on a Likert scale. *Evaluation & the Health Professions*, 6, 483-491.
- Bmg Research (2011): Cumbria Business Survey 2010 - Research report. Cumbria, Cumbria Intelligence Observatory
- Climate Ready, (2015): Briefing paper – business and service. Bristol, Environment Agency
- Crichton, D. (2006): Climate change and its effects on small businesses in the UK. London, AXA Insurance UK.
- Doocy, S., Daniels, A., Murray, S., and Kirsch, T. D. (2013): The Human Impact of Floods: a Historical Review of Events 1980-2009 and Systematic *Literature Review*. PLoS Currents,5 doi :10.1371/currents.dis.f4deb457904936b07c09daa98ee8171a
- Erickson, K.T. (1998): Trauma at Buffalo Creek, *Society*. 35:2:153-61.
- Etuonovbe, A.K.(2011).*The devastating effect of flooding in Nigeria*, Hydrography and Environment, TS06J, Epworth, Zimbabwe.FIG Working Week 2011
- Gobo, A.E., and Abam, T.K.S (1991): The 1988 Floods in the Niger Delta: The Case of Ndoni. *The Journal of Meteorology*. Vol.16. No.163
- Ingirige, B., Jones, K. and Proverbs, D. (2008): Investigating SME resilience and their adaptive capacities to extreme weather events: A literature review and synthesis. Proceedings of the Conference on Building Education and Research (BEAR 2008). Kandalama, Sri Lanka
- Know Risk, (2005): United Nations, Geneva, Switzerland
- Kron W (2005): Flood Risk = Hazard • Values • Vulnerability *International Water Resources Association*, Volume 30 (1): 58–68

- Krug, E., Kresnow, M.J., Peddicord, J.P., et al., (1998). Suicide rates up after natural disasters, *New England J. of Medicine*, 338:373-378.
- Maurer, J., and Pierce, H. R. (1998). A comparison of Likert scale and traditional measures of self-efficacy. *Journal of Applied Psychology*, 83, 324-329.
- McMillan, J.H. and Schumacher, S. (1997): *Research in education: A conceptual introduction*.4th ed. New York: Longman.
- Obeta, M.C (2010). Flood incidences in the Lower Niger River Basin, Nigeria, *Journal of Geography and Development*, Vol.2 (2):300-311
- Olajuyigbe, A.E.; Rotowa, O.O. and Durojaye, E. (2012): An Assessment of Flood Hazard in Nigeria. The Case of Mile 12, Lagos. *Mediterranean Journal of Social Sciences*. 3(2): 367-377. (2012). An Assessment of Flood Hazard in Nigeria: The Case of Mile 12, Lagos. *Mediterranean Journal of Social Sciences* Vol. 3 (2).
- Ologunorisa, E.T. and Tersoo, T (2006): The changing rainfall pattern and its implication for flood frequency in Makurdi, Northern Nigeria, *Journal of Applied Science and Environmental Management*, Vol.10(3): 97-102.
- Ologunorisa, E.T. (2004): An assessment of flood vulnerability zones in the Niger Delta, Nigeria, *International Journal of Environmental Studies*, Vol.61,31-38.
- Otomofa, J. O.; Okafor, B. N; Obienusi, E. A (2015): Evaluation of the Impacts of Flooding On Socio-Economic Activities in Oleh, Isoko South Local Government Area, Delta State, *Journal of Environment and Earth Science* Vol.5, No.18, 2015
- Ritchie, L. Lewis, J. & Elam, G. (2003): Designing and Selecting Samples in Ritchie, J. & Lewis, J. (eds.) (2003) *Qualitative Research Practice: A Guide for Social Science Students and Researchers*. London: Sage publications pp. 77-108
- Smith, B.W. (1996). Coping as a predictor of outcomes following the 1993 Midwest flood, *J. of Social Behavior & Personality*:11(2) June, 225-239.
- Tobin, G. and Ollenburger, J.C. (1996). Predicting levels of postdisaster stress in adults following the 1993 floods in the upper midwest, *Env. & Behavior* 28(3): 340-357.
- Vickers, A., (1999): Comparison of an ordinal and a continuous outcome measure of muscle soreness. *International Journal of Technology Assessment in Health Care*, 15, 709-716.
- West, C.T. and Lenze, D.G. (1994): Modeling the regional impact of natural disaster & recovery: a general framework and an application to Hurricane Andrew, *Intl. Reg. Sci. Rev.* (17)2,121-151.