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**EFFECTIVE WATERSHED MANAGEMENT FOR
ENVIRONMENTAL HAZARD CONTROL/
MITIGATION IN NIGERIA**

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**HEALTH HAZARDS ASSOCIATED
WITH FLOODING**

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Abstract

Flooding is a common global programme .it is the most reoccurring natural hazards worldwide. With the advent of erratic climatic manifestation as a result of global warming, it has assumed a hazardous proportion.

Flood prone areas has been identified in the study and the health hazard associated with them highlighted and classified into infection and diseases, drowning, trauma, mental health, post flooding carbon monoxide and dangerous animals attack . By far the most common is the attendant infectious diseases that are mainly water borne and vector related such as diarrhoea, malaria,. Strategies to reduce the health hazards associated with flooding suggested include Public education, emergency service planning and early warning system.

1.0 Introduction

Flooding, a common environmental problem, describes the movement of a body of water above an area of land which is not usually submerged, that is, the inundation of an area not normally covered with water through a temporary rise in level of a water body (e.g. stream, rivers, ponds and lakes.) (Agbonkhese et al., 2014). Sada and Odemerho (1988) also define flooding as unusually high rates of discharging, often leading to inundation of land adjacent to streams, and it is usually caused by intense or prolonged rainfall. Floods are the most recurring, widespread, disastrous and frequent natural hazards of the world. Floods are the most common natural disasters in both developed and developing countries and they are occasionally of devastating impact. According to Nelson (2001), flood is a natural consequence of stream flow in a continually changing environment.

Flooding occurs as a result of both man-made and natural causes. Causes of flooding include poor drainage facilities, indiscriminate refuse/waste dumping, inadequate environmental laws and its enforcement, lack of proper environmental planning and management strategies, global climate change and inadequate preparedness to handle emergency situations (Agbonkhese et al., 2014). Heavy downpour and other serious weather conditions may also result in flooding.

Flooding is a common phenomenon in Nigeria. In its wake, it brings devastating impacts to life, property and infrastructure. Some of these include loss of lives, spread of diseases... Flooding occurs in Nigeria in three main forms which are: river flooding, urban flooding and coastal flooding. The Nigerian Meteorological Agency (NIMET) is the body saddled with the responsibility of forecasting the weather, issuing warnings where necessary and developing methods to combat weather-related issues like drought, heavy rains, flooding, etc. The common and recurrent phenomenon of flooding in Nigeria occurs on a regular perennial basis in some parts of the nation. However according to NEST (1991), the

following geographical areas suffer from the hazard more than others in Nigeria:

- (a). Low-lying areas in the southern parts of the nation where annual rainfall is very heavy.
- (b). The Niger Delta zone
- (c). The floodplains of the larger rivers of the Niger, Benue, Taraba, Sokoto, Hadeja, Cross River, Imo, Anambra, Ogun, Kaduna .
- (d). Flat low-lying areas around and to the south of Lake Chad which may be flooded during, and for a few weeks after the rain.

Flash floods due to poor town and regional planning phenomenon

Nigeria falls in the intermediate rank for global flood exposure (Fig. 1) explaining her susceptibility to flooding and its attendant effects.

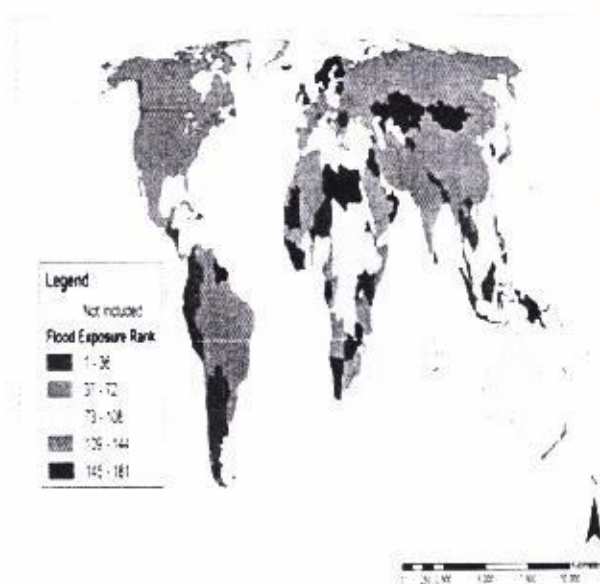


Fig. 1: Global distribution of Floods

2.0 Effects of Flooding

The effects of flooding cut across socio-economic, environmental, agricultural and health circles. Part of the effects of flooding include contamination of water supplies, spread of epidemic diseases (diarrhoea, typhoid, scabies, cholera, malaria and dysentery), destruction of economic and social infrastructure such as water supply, electricity, roads, bridges and railway lines, destruction of

buildings (homes and commercial structures), farmlands and plantations, monumental structures and other physical properties.



Fig 2 Farm land destroyed by flooding in Minna area, Niger State



Fig 3 Population displacement in a flooded area of Markurdi, Nigeria



Fig 3 Quake induced flooding in Peru

3.0 Hazards

Deleterious effects to health can result from flooding as a result of the water itself, the objects it destroys or the pathogens the water carries.

3.1 Infections and Diseases

Flood water can be contaminated with bugs and insects hence; there is a risk of injury and disease for anyone who comes in contact with the water. Water-borne diseases such as typhoid fever, cholera, leptospirosis and hepatitis A, and vector-borne diseases like malaria, dengue and dengue haemorrhagic fever, yellow fever and West Nile Fever are possible resultant effects. For water-borne diseases, the risk of infection is increased when there is significant population displacement. Of the 14 major floods which occurred globally between 1970 and 1994, only one led to a major diarrhoeal disease outbreak - in Sudan, 1980. Floods in Mozambique in January-March, 2000 led to an increase in diarrhoea incidence. Floods in West Bengal in 1998 led to a large cholera epidemic. This was probably because the flood was complicated by population displacement. The occurrence of flooding after heavy rainfall facilitates the spread of the organism due to the proliferation of rodents which shed large amounts of leptospirae in their urine. Outbreaks of leptospirosis occurred in Brazil (1983, 1988 and 1996), in Nicaragua (1995), Krasnodar region, Russian Federation (1997), Santa Fe, USA (1998) Orissa, India (1999) and Thailand (2000). It is likely that environmental changes increased the vector (rodent) population which facilitated transmission. The current upsurge of the Lassa fever in Nigeria could be indirectly linked to flooding.

Floods may also indirectly lead to an increase in vector-borne diseases through the expansion in the number and range of vector habitats. Standing water caused by heavy rainfall or overflow of rivers can act as breeding sites for mosquitoes, thereby enhancing the potential for exposure of flooding-affected population and emergency workers to infections. When flooding occurs, it initially flushes out mosquito breeding but when the flood waters recede, it usually takes about 6 to 8 weeks before the onset of a potential malaria epidemic. Malaria epidemics in the wake of flooding are a well-

known phenomenon in malaria-endemic areas world-wide. For instance, an earthquake and subsequent flooding in Costa Rica's Atlantic region in 1991 and flooding on the Dominican Republic in 2004 led to serious malaria outbreak that led to many deaths. The risk of outbreaks is greatly increased by complicating factors, such as changes in human behaviour (increased exposure to mosquitoes while sleeping outside, a temporary pause in disease control activities, overcrowding), or changes in the habitat which promote mosquito breeding (landslide, deforestation, river damming, and rerouting). Periodic flooding linked to El Niño-Southern Oscillation (ENSO) is associated with malaria epidemics in the dry coastal region of northern Peru and with the resurgence of dengue in the past 10 years throughout the American continent.

West Nile Fever has resurged in Europe subsequent to heavy rains and flooding, with outbreaks in Romania in 1996-97, in the Czech Republic in 1997 and Italy in 1998. Floodwaters may also be contaminated with human/animal faeces, pesticides/insecticides, fertilizers, oil, asbestos, rusting materials, and such like.

3.2 Drowning

Drowning is the most immediate health risk during floods, especially in fast-flowing water. It can happen whether one is walking, cycling or driving. Hypothermia may also be a problem, especially in children, if trapped in flood waters for lengthy periods. Risks of Respiratory Tract Infections are also high due to exposure.





Fig 4 Drowning is a high risk Examples from Ibadan Nigeria

3.3 Trauma

The trauma related to flooding, for example being hit by objects in fast moving waters comes in second behind drowning in causes of death in cases of flooding (Ahern et al, 2005). Excessive exposure to moulds and mildews can cause flood victims – especially those with allergies and asthma – to contract upper respiratory diseases and to trigger cold-like symptoms, e.g. sore throat, watery eyes, wheezing and dizziness (CDC 2006; FEMA 2005; North Carolina Department of Health and Human Services).

3.4 Dangerous animals

The increased water level during flooding dislodges potentially dangerous animals like snakes and crocodiles, which may then be transported to the residential areas. Bites from these reptiles are also a major health risk related to events of flooding.



Fig 5 Big Reptile washed to dwellings as a result of flooding, Kaduna State, Nigeria

3.5 Mental Health

It is generally accepted that natural disasters such as earthquakes, hurricanes, floods take a heavy toll on the mental health of the people involved. Common flood-related mental problems include common mental disorders (anxiety, depression), Post-Traumatic Stress syndrome, and suicide. Most of the victims live in developing countries, where the capacity to manage such problem is extremely limited (WHO, 2001). Flood exposure is generally associated with significant increases in depression and anxiety (and also physical symptoms), especially in those with higher levels of pre-flood depressive symptoms and in those from lower socio-economic groups (Phifer et al., 1988, Phifer, 1990). Pre- and post-flood examination of the behaviour of children affected by flooding show an increase in aggressiveness and bedwetting in some children after flooding (Durkin et al., 1993).

Bennet (1970), in his analysis of the 1968 Bristol floods found a significant increase in the number of new psychiatric symptoms (considered to comprise anxiety, depression, irritability, and sleeplessness) reported by women from flooded compared with non-flooded areas, although there was no significant difference for men. These results broadly agree with the findings for the 1974 Brisbane floods (Abrahams et al., 1976), except that in Brisbane men were also affected. Those between 35 and 75 years of age suffered the greatest impacts (Price, 1978). Becht et al. (1998), interviewed children and their parents 6 months post-flood in Netherlands, and discovered that 15-20% of the children developed moderate to severe stress symptoms.

3.6 Post-flood carbon monoxide (CO) poisoning

Post-flood carbon monoxide (CO) poisoning is reported to be a growing problem in many developed countries. CO can be found in combustion fumes, e.g. fumes generated by small gasoline engines, stoves, generators, lanterns, and gas ranges, or by burning

charcoals and woods. In the event of power outages following floods, the flood victims tend to use alternative sources of fuels or electricity for heating, cooling, or cooking inside enclosed or partly enclosed houses, garages or buildings without an adequate level of air ventilation (Environmental Health Centre, 2001). CO builds up from these sources and poisons the people and animals inside. CO poisoning therefore should be regarded as a potential hazard after major floods.



Fig. 6 Emmision of post flood CO in Lagos –Oshodi flood, Nigeria

3.7 Indirect effects

Many a time, raw sewage may be mixed with the flood waters, which flow into flooded homes. This situation is a recipe for outbreaks of diseases and infections. Flood-related power cuts may disrupt water treatment and supply plants. This may cause victims to resort to unsafe water sources, thereby increasing the risk of water-borne diseases. This may also affect proper functioning of health facilities.

Other health effects attributable to flooding include epilepsy (Swinkels et al., 1998), leukaemia, lymphoma, spontaneous abortion, chemical contamination (Janerich et al., 1981), schistosomiasis (Zhang et al., 2002), etc..

Other evidences of devastating effects of floods are China (1959), Bangladesh (1974) and the tsunami-generated floods of Southeast Asia (2004) (CRED, 2005).

The health and environmental tests carried out on the floodwaters in New Orleans where the unprecedented flooding and destruction was caused by Hurricane Katrina – one of the worst natural disasters to ever occur in the United

States – and hundreds of thousands of residents lost homes and were displaced in temporary shelters. The tests revealed a clear signal of bacteria and lead hazards to human health and warned the public to avoid exposure to the contaminated water (Gerencer 2005).

4.0 Conclusion

The health impacts of floods are wide ranging, and depend on a number of factors. However, the health impacts of a particular flood are specific to the particular context. The immediate health impacts of floods include drowning, injuries, hypothermia, and animal bites. Health risks also are associated with the evacuation of patients, loss of health workers, and loss of health infrastructure including essential drugs and supplies. In the medium-term, infected wounds, complications of injury, poisoning, poor mental health, communicable diseases, and starvation are indirect effects of flooding. In the long-term, chronic disease, disability, poor mental health, and poverty-related diseases including malnutrition are the potential legacy.

Nonetheless, the wide range of risks to health and well-being, both physical and mental, is well understood, though there remains scientific uncertainty about the strength of association and public health burden for specific health effects. The immediate risks of trauma and death are generally clear, but it seems that longer-term impacts, specifically on mental well-being, are often underestimated and probably receive too little attention from public health authorities. These and the location-specific infectious disease risks require further study.

The potential health risks of floods depend on the characteristics of the flood: its scale, duration, suddenness of onset, velocity and depth of water and lack of warning, and of the population it affects. Floods which have the largest impact on the health of the victims occur where infrastructure is poor and the population at risk has limited economic resources (Ahern et al., 2005).

There is much that can be done to reduce health and other impacts through public education,

emergency service planning, and the implementation of early warning systems (Few et al., 2004)). On the other hand, there are clear research needs to improve understanding of the health risks in different settings and of the social and cultural modifiers of those risks. There is also more to understand about the long-term consequences of flooding on health and about the mechanisms by which such consequences can best be prevented or alleviated.

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