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Vulnerability and Environmental Security: Assessing the Impact of Disasters on a Community

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ABSTRACT Vulnerability is the extent to which a community can be affected by the impact of a hazard while environmental security is environmental viability for life support. Environmental security affects humankind and its institutions and organizations anywhere and at anytime. This paper aims at examining the concepts of vulnerability and environmental security and assessing the impact of disasters on a community. Data were obtained through secondary sources coupled with review of literature. This paper reveals that about 1.2 million people are killed in traffic accidents every year in the world; in the United States about 43,000 people are killed in fatal car accidents every year while in Nigeria, according to the World Health Organization about 32,000 people die yearly through road accidents. This paper also shows that the Pandemic that occurred between 1330 and 1351 killing 75,000,000 people was the deadliest natural disaster ever experienced in the world. This paper reveals that Nigeria has suffered a lot from the problem of disaster. The world Disaster Report gave an annual average of people killed and affected by disasters in Nigeria as 96,786 representing 0.09% of people killed and affected by disasters in the world. In addition this paper discloses that there has been series of building collapses in Nigeria; in Lagos State alone, over 100 buildings have collapsed since 1978. Finally recommendations were made and the need for government at all levels to exhibit strong political will regarding disaster management in order to mitigate its occurrence and impact is highlighted.

INTRODUCTION

Vulnerability is the susceptibility to physical or emotional injury or attack. It also means to have one's guard down, open to censure or criticism. Many academic disciplines and knowledge-practice communities use the term 'vulnerability' to denote a condition or situation in which people or human communities and/or their assets and livelihoods are susceptible to injury, loss, or disruption. While natural hazards research and development studies tend to view vulnerability as socially and historically constructed and a function of the situation of households and individuals, public health and epidemiology, as well as humanitarian assistance research see it in terms of the properties of whole demographic classes of humans.

Disasters are very selective and discriminatory (Ijewere 2003). They seek out the weakest, poor quality building, the unstable soil, the most degraded environment, the poorest households, the politically, socially or culturally most marginalized, the least resourceful, the physically weakest individuals. These are all more susceptible to disasters than other categories.

The impacts of disasters, whether natural or man-made, not only have human dimensions, but environmental ones as well. Environmental conditions may exacerbate the impact of a disaster, and vice versa, disasters have an impact on the environment. Deforestation, forest management practices, agriculture systems etc. can exacerbate the negative environmental impacts of a storm or typhoon, leading to landslides, flooding, silting and ground/surface water contamination (Srinivas 2013).

Vulnerability

In relation to hazards and disasters, vulnerability is a concept that links the relationship that people have with their environment to social forces and institutions and the cultural values that sustain and contest them. "The concept of vulnerability expresses the multidimensionality of disasters by focusing attention on the totality of relationships in a given social situation which constitute a condition that, in combination with environmental forces, produces a disaster" (Bankoff et al. 2004). It is also the extent to which changes could harm a system. In other words, it is the extent to which a community can

be affected by the impact of a hazard. In global warming, vulnerability is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.

Vulnerability research covers a complex, multidisciplinary field including development and poverty studies, public health, climate studies, security studies, engineering, geography, political ecology, and disaster and risk management. This research is of particular importance and interest for organizations trying to reduce vulnerability – especially as related to poverty and other Millennium Development Goals. Many institutions are conducting interdisciplinary research on vulnerability. Researchers are currently working to refine definitions of "vulnerability", measurement and assessment methods, and effective communication of research to decision makers (Birkmann et al. 2006).

Within the body of literature related to vulnerability, major research streams include questions of methodology, such as: measuring and assessing vulnerability, including finding appropriate indicators for various aspects of vulnerability, up- and downscaling methods, and participatory methods (Villagran 2006). A sub-category of vulnerability research is social vulnerability, where increasingly researchers are addressing some of the problems of complex human interactions, vulnerability of specific groups of people, and shocks like natural hazards, climate change, and other kinds of disruptions.

Environmental Security

In the academic sphere environmental security is defined as the relationship between security concerns such as armed conflict and the natural environment. A small but rapidly developing field, it has become particularly relevant for those studying resource scarcity and conflict in the developing world. The Millennium Project did a global assessment of the definitions of environmental security and created a synthesis definition: Environmental Security is environmental viability for life support, with three sub-elements: preventing or repairing military damage to the environment, preventing or responding to environmentally caused conflicts, and protecting the environment due to its inherent moral value.

The environment is the most transnational of transnational issues. Its security is an important dimension of peace, national security and human rights that is just now being understood. It has been projected that over the next 100 years, one third of current global land cover will be transformed, with the world facing increasingly hard choices among consumption, ecosystem services, restoration, and conservation and management. Environmental security is central to national security, comprising the dynamics and interconnections among the natural resource base, the social fabric of the state, and the economic engine for local and regional stability. While the precise roles of the environment in peace, conflict, destabilization and human insecurity may differ from situation to situation and as such are still being debated in relation to other security and conflict variables, there are growing indications that it is increasingly an underlying cause of instability, conflict and unrest.

The concept of environmental security should not be equated with an argument that environmental change is the sole causative factor in triggering conflicts or other security concerns nor even that environmental change is necessarily a direct trigger of conflict. There is probably not a single conflict in the world that can properly be understood as mono causal. Rather, environmental degradation may be mediated and sometimes augmented by social disparities, ethnic and community rivalries, and political dynamics. A multitude of pressures including persistent poverty, wealth disparities, unequal land distribution, unemployment and job insecurity, population growth, health epidemics, and environmental degradation is provoking social stress, discontent and polarization, leading to political strife in many countries and to devastating violence in some (Akinjide 2011).

The basic framework for understanding the relationship between environment and security is the Millennium Ecosystem Assessment which looks at all the functions of ecosystems and the services they deliver to people and nature. Conceptually one may make a difference between environmental services and natural resources such as minerals, oil and gas. They also may lead to conflicts - and very often do! But then it is not scarcity, but abundance, and the motives are not need, but greed. In practice, mining the minerals and exploiting the oil, coal and gas, can

lead to serious environmental degradation through pollution, infrastructure, corruption and violent conflicts.

METHODOLOGY

In order to appropriately describe the concepts of vulnerability and environmental security and assess the impact of disaster on a community, valuable information was obtained on vulnerability, environmental security, differences between physical and social vulnerability from textbooks and internet. In addition data were collected from secondary sources on:

- o Deadliest natural disasters experienced in the world(shown in Table 1)
- o Traffic accidents in the World, U.S.A. and Nigeria
- o Fatal crash statistics in the United States from 1997-2005(shown in Table 2)
- o Prevailing hazards in Nigeria
- o Average number of people affected by disasters in Nigeria

RESULTS

Data collected on the deadliest natural disasters by kind of event revealed that Pandemic (Black Death) that occurred worldwide between 1330 and 1351 killing 75,000,000 people was the deadliest natural disaster ever experienced in the world (See Table 1 for the list of deadliest natural disasters by kind of event).

According to the World Health Organization there are about 1.2 million people killed in traffic accidents every year, 10 million are people injured, costing an estimated $520 billion! (Fatal Car Accident Statistics 2010). Furthermore, according to the National Highway Traffic Safety Administration there are about 43,000 people killed in fatal car accidents each year in the United States. Forty percent of the fatal crashes are alcohol-related. In addition to fatal accidents, about 2.9 million people are injured each year (See Table 2 showing fatal crash statistics in the United States from 1997-2005). There were nearly 6,420,000 auto accidents in the United States in 2005. The financial cost of these crashes is more than 230 billion dollars. 2.9 million people were injured and 42,636 people killed. About 115 people die every day in vehicle crashes in the United States — one death every 13 minutes (Car Accident Statistics 2010).

However, in Nigeria, controversy has continued to trail the exact number of deaths recorded yearly through road accidents in Nigeria, with the World Health Organization (WHO), the National Union of Road Transport Workers (NURTW) and the Federal Road Safety Commission (FRSC), giving conflicting reports. While the World Health Organization claimed that 32, 000 died yearly through road accidents

Table 1: Deadliest natural disasters in the world by kind of event

Event	*Event Name*	*Location*	*Date*	*Death Toll(Estimate)*
Avalanche	Wellington avalanche	United States	March 1,1910	96
Blizzard	Iran Blizzard	Iran	February 1972	4,000
Drought	Great Famine of 1876-78	India	1876-1878	5,250,000
Earthquake	Shaanxi Earthquake	China	1556	830,000
Flood	1931 China floods	China	1931	1,000,000-4,000,000
Hailstorm	Roopkund Uttaranchal	India	9th Century	200-600
Heat wave	European Heat Wave of 2003	Europe	2003	37,451
Landslide	1999 Vargas mudslide	Venezuela	1999	20,006
Limnic Eruption	Lake Nyos	Cameroon	1986	1,746
Pandemic	Blake Death	Worldwide	1330-1351	75,000,000
Tornado	Saturia-Manikganj Sadar Tornado	Bangladesh	April 26,1989	1,300
Tropical Cyclone	1970 Bhola cyclone	Bangladesh	November 13,1970	200,000-500,000
Tsunami	India Ocean Earthquake and Tsunami	India Ocean	December 26,2004	285,000
Volcano	Mount Tambora	Indonesia	1815	92,000
Wildfire	Peshtigo Fire	United States	October 8, 1871	2,000

Source: http://www.nationmaster.com/encyclopedia/List-of-natural-disasters-by-death-toll

Table 2: Fatal crash statistics in the united States by year

Total traffic crashes in the United States	*2005*	*2004*	*2003*	*2002*	*2001*	*2000*	*1999*	*1998*	*1997*
Fatal Vehicle Crashes	39,189	38,444	38,477	38,491	38,862	37,526	37,140	37,107	37,324
Fatality Totals:									
Drivers	27,472	28,871	26,779	26,659	25,869	25,567	25,257	24,743	24,667
Passengers	10,036	10,355	10,458	10,604	10,469	10,695	10,521	10,530	10,944
Other	86	78	104	112	102	86	97	109	114
Sub-total	37,594	37,304	37,341	37,375	36,440	36,348	35,875	35,382	35,725
Non-Motorists Killed									
Pedestrians	4,881	4,675	4,774	4,851	4,901	4,763	4,939	5,228	5,321
Bicyclists	784	727	629	665	732	693	754	760	814
Other	184	130	140	114	123	141	149	131	153
Total Killed	43,443	42,836	42,884	43,005	42,196	41,945	41,717	41,501	42,013

Source: Based on the Data Compiled by the US Federal Government. National Highway Traffic Safety Administration (NHTSA)

in Nigeria, the FRSC however, claimed, there was no year that Nigeria lost 32, 000 lives to road accidents, insisting that the country had only recorded between 4,000 and 5,000 deaths from road accidents, in the last three years. The main users of the roads, NURTW, throwing a tactical support behind the international agency, said that the figure given by WHO was over three times the officially reported (Daniel 2009). Nigeria as a country has suffered a lot from the problem of disaster. The world Disaster Report (a publication of the International Federation of Red Cross and Crescent societies 2002 edition) gave an annual average of people killed and affected by Disasters in Nigeria as 96,786 representing 0.09% of people killed and affected by Disasters in the world (Alabi and Ugbelase 2010).

Disasters experienced in Nigeria include landslide, thunder, windstorm, flooding, soil erosion, earthquake, tremor, volcanic eruptions or coastal erosions while the manmade ones include damfailure, maritime disasters, bomb explosion, conflict / crisis, occasioning displacement of victims, oil spillage, population explosion and train accidents and air crashes. Nigerians have been lucky with earthquakes but not so fortunate with floods, pollution and oil spillages, ethnic disturbances such as ethnic conflicts between Hausa –Igbo and Yoruba – Hausa. The country has also had its fair share of air disasters. Nigeria recorded about 400 major fire and aircraft disasters involving more than 10,000 people with death toll of about a thousand plus between 1992 and 2000, and quantum of property destroyed was evaluated to be in tens of millions of dollars. Farmlands and houses have been washed off by erosion in the Northern and Southern parts of the country, oil spillage have displaced the Ijaw fisherman and their farming counterparts have more or less been rendered jobless too because of the effects of the spillage on the ecosystem.

In recent times, there has been a sequence of building collapses in Nigeria, from North to South, West to East. This ugly incidence that has now become a reoccurring decimal all over Nigeria had sent a lot of Nigerians to their early grave. In Lagos State, over 100 buildings have collapsed since 1978, according to records from the State Physical Planning Development Authority (Okpi 2009). However, many incidents were not reported so this number is only the ones that were reported. The statistics show that in 2007 and 2008, the state recorded seven collapsed buildings each, the buildings range from private homes to government quarters. The causes of collapsed buildings include poor foundation, use of sub-standard building material, noncompliance to the approved plan and lack of supervision by qualified professionals. However, the recent intervention of the state government has led to a reduction in the incidents of collapsed buildings.

DISCUSSION

The world is facing an increasing frequency and intensity of disasters - natural and manmade - that has had devastating impacts. As reported by the secretariat of the International Strategy for Disaster Reduction (ISDR), the last

ten years have seen 478,100 people killed, more than 2.5 billion people affected and about US$ 690 billion in economic losses. Disasters triggered by hydro-meteorological hazards amounted for 97 percent of the total people affected by disasters, and 60 percent of the total economic losses (Srinivas 2013).

As shown in Table 1 the deadliest natural disasters by kind of event in the world are: avalanche, blizzard, drought, earthquake, flood, hailstorm, heat wave, landslide, limnic eruption, pandemic, tornado, tropical cyclone, tsunami, volcano, and wildfire. Pandemic (called Black Death) recorded the highest death toll of 75,000,000 followed by Great famine of 1876-78 that had a death toll of 5,250,000. Wellington avalanche recorded the lowest death toll of 96 people.

In Nigeria, the prevailing natural hazards are : drought and desertification, flooding, catastrophic soil erosion, destructive storms, dust storms, coastal erosion, earth tremors, pest invasion, human disease epidemic, animal disease epidemic while the man-made hazards include dam failure, building collapse, oil spillage, land, water and air transport accidents, bomb explosion, civil strike, fire disaster and wildfire (Alabi and Ugbelase 2010).

Barry Smit et al. (2005) examined the differences between physical and social vulnerability. Physical vulnerability is described as the sensitivity of the physical system, or the likelihood of exposure (Liverman 1994; Cutter 1996). Research in natural hazards and climate change often uses biophysical conditions to define vulnerability (Liverman 1994; Smith and Lazo 2001). Populations are considered vulnerable if they live in hazardous locations, and their ability to reduce the effect of hazard via adaptation is greatly downplayed. Thus, vulnerable populations are understood to be those who live in areas with a high probability of occurrence of potentially problematic physical phenomena such as earthquakes, tsunamis, hurricanes etc. Physical vulnerability is seen to be related to the degree of inundation with sea level rise, or the increased frequency of drought – and it is indicated that such vulnerability can be characterized independently of the resource use or livelihood features of the population, and independently of the population's abilities to deal with their physical hazards. This physical or biophysical vulnerability essentially is about the *exposure* of a system to physical stimuli with little reference to adaptation or livelihood strategies, and does not develop the social forces that may have influenced the location of certain groups in hazardous areas. The term "social vulnerability" emerged from the recognition that exposure to environmental stress alone was not the only component influencing vulnerability (Liverman 1994). Physical hazards, disasters, climate change and variability cause tremendous harm, but harm (and hence vulnerability) is also influenced by existing social conditions. Social conditions enhance or reduce the susceptibility to harm from hazardous events (famine, drought, disease, flooding).

Social vulnerability has been related to many factors including marginalization, equity, the role of institutions, food and resource entitlements, economics and politics (Adger and Kelly 1999; Adger 2000). These are considered attributes of a social system that increase exposure and/or limit adaptive capacity. An examination of social vulnerability includes an understanding of the human use of and access to resource which in turn determines the ability of an individual or society to cope with and adapt to change (Wisner et al. 2004).

Sen (1981) recognizes the role of social vulnerability in exacerbating or reducing impacts of a hazardous physical event. The occurrence of famine is not simply because of natural events but also the social, economic and political conditions that make people susceptible to the event and limit the capacity to cope or deal with it. Thus, the capacity to adapt to hazard stress is rooted in the ability of an individual or community to compete for access to rights, resources and assets. Mustafa (2002) showed the importance of the unequal distribution of power and wealth as fundamental elements of vulnerability to floods. Other fields, such as natural hazards, resource management and sustainable development, have increasingly employed concepts of vulnerability that recognize that both physical stimuli and human conditions contribute to exposure and are essential to adaptive capacity.

In the climate change scholarship, social vulnerability has been described as an issue of entitlements, where access, availability, and distribution of resources determine or influence or define the level of vulnerability of a social group (Liverman 1994; Adger and Kelly 1999). The extent to which individuals, groups or communities are entitled to use resources determines the

ability of that population to cope and adapt to stress (Adger and Kelly 1999). Inequality affects vulnerability by constraining the options of systems when faced with changing conditions, that is, by constraining their adaptive capacity. Inequity within a population can increase social vulnerability to climate change as climate change can alter communal allocation of resources.

CONCLUSION

In the face of massively interacting threats (climate change, violence, poverty, disease, and displacement) and natural disasters, a case is made for the research and policy communities to accelerate their cooperation in identifying and mapping community vulnerabilities for environmental security. The traditional methods of gathering and manipulating data should be supplemented by the use of remote sensing, automated terrain modeling, global positioning systems and geographical information systems.

The world's political, legal and economic institutions from the global to the local level should formulate and implement preventive policies through improved and innovative institutional and financial arrangements. Our ability (or lack thereof) to make innovative institutional arrangements and/or technological advances for managing the environmental security challenges we face, will increase or decrease global environmental security.

Members of communities and local voluntary institutions are better placed to conduct Vulnerability and Capacity Assessment (VCA) as part of their contribution to management of disasters. Vulnerability and Capacity Assessment is a method of assessing existing vulnerabilities and capacities in communities with a view to addressing the vulnerabilities as well as harnessing the capacities. Also, government at all levels should exhibit strong political will regarding disaster management in order to mitigate its occurrence and impact.

RECOMMENDATIONS

Based on the strength of the results presented in this paper, the following recommendations are proposed:

There is the need for accurate identification of community vulnerability due to the rapid growth in population, settlements, transportation infrastructure and intensified land uses and, therefore, risk and vulnerability.

Methods of hazards identification should involve intensive and lengthy fieldwork and mapping augmented by the use of air photos and ad hoc observations of specific events over time. These methods will result in the gradual accumulation of information on hazardous sites and the beginnings of a chronology of occurrences in an area.

Global institutions need to be equipped for the 21st Century and should deal with environmental security challenges by peaceful means.

Risk analysis of future developments must be based on a broad concept of security and they must include social, economic and ecological trends and be viewed in relation to the security of the world.

To avert the menace of building collapse, all stakeholders: government agencies, all professionals in the building industry, the artisans and tenants, must work together. If quality is assured at all the stages of construction, starting from the design stage, building collapse will reduce.

The Federal Government of Nigeria should evolve an effective and comprehensive disaster management plan for the country. Also, the government should identify disaster prone areas and device programmes for possible, voluntary relocation to areas that are less disaster prone.

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