EFFECTS OF HURRICANE AND TORNADO ON SOCIO-ECONOMIC DEVELOPMENT

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Abstract

Man's activities on the planet earth are increasingly reflecting via terrific responses of monumental proportion. Climatic changes and global warming are among the frequently cited examples. However, it is still true that, hurricane and tornado, are not only linked to the global warming, but are also precipitated by the human day-to-day exploitation of the environment. This couple of environmental disaster has been ravaging many human and animal populations for an eon. The study found that, the incidences of hurricane and tornado devastate the well being of inhabitants of the affected environment, staggering lost of valuable resources, population displacement, destruction of public and private and buildings are also potential consequences of these disasters. Destruction of farm lands is perhaps the most threatening to agricultural production and it is recorded to be one of the outcomes these disasters. It is therefore imperative for governments to place more emphasis on precautionary measures by equipping geophysical or environmental management system with sophisticated paraphernalia. The global community/population, too, must be wary of how the environment is (mis) used.

Keywords: *natural hazards, geophysical disasters, hurricane, tornado, greenhouse, global warming, socio-economic, development*

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Introduction

Different parts of the world are plagued by one form of environmental hazard or the other. This assertion is with no exception. It doesn't matter for an incidence to be emanated from social or a natural phenomenon. What matters is how we are trying to understand the problem, assess it, minimize its possible occurrence and by implication its effects on humans irrespective of their locations. This is because of the fact that we are connected somehow. Not only on flooding, desert encroachment, and global warming, Nigeria has a stake in trying to mitigate the impacts of such alien disasters as hurricane and tornado. For example, study found that, the 2012 Hurricane Sandy which affected Caribbean (Jamaica, Cuba, The Bahamas, Haiti, The Dominican Republic) and the eastern seaboard of the United States of America has possible splash back effect on Nigerian coast lines and shores, particularly at Lagos water bodies. The Commissioner for waterfront Development and Infrastructure, Lagos State, Mr. Adesegun Oniru, said "we always get ripple effects of such happenings in Lagos. This wind started in Africa, went west gathering more wind and later turning to hurricane "Let us be careful around our oceans and lagoons" (The Punch, 25th May, 2014).

In addition, agriculture is regarded as an important economic base of many countries in the world. It generates income and employment to the vast majority of population in the Caribbean and Africa; it is the viable medium for investments, and a source of foreign exchange earnings. It is however studied that, agriculture is often the most vulnerable to the havoc wreaked by this couple of, and other, disasters because of poor strategic planning of protecting it or to, at least, reduce the harm agriculture could encounter. When hurricanes and tornadoes hit a place, there are usually fatal cases, extermination of some aquatic organisms leading subjecting them to extinction, destruction of trees, shelters, public buildings and relocation of population to other places by force. As an expert in the environmental studies, Joseph Ouma(1986) intimated us about the need for universal education on the use of natural environment, thus:"The environment is the business of everybody, development is the business of everybody, life and living is the business of everybody. The solution will be found in encouraging mass environmental literacy so that there can be democratic and literate decisions (making)".

Looking at the fragile earth's condition, it became imperative for the global population to have disaster reduction knowledge and reliable alternative for excessive release of carbon dioxide in

order to reverse the effect of global warming which accelerates the occurrence of such disasters. In line with the above, Abdullahi (in Ibrahim, 2002) said, "a good understanding of the global environmental issues is necessary, especially their natures, causes, magnitude, consequences, and management for any meaningful solutions". Some governmental agencies for management of geophysical hazards are established. These management systems entail procedure for forecasting and for raising a warning, hazard protection, disaster relief and recovery. The systems therefore work so hard to foresee the occurrence of volcanoes, earthquakes, the cyclones and anti-cyclones.

This paper aims at explaining the effects of hurricane and tornado on socio-economic development. Acknowledging the availability of few benefits, the positive effects will not be disregarded. It will fundamentally make little sense to side-step causes and go ahead giving consequences; hence the causal factors will also be reviewed. However it takes more than forecasting to arrive at solution. People must know what eco-friendly activity required of them to embrace it. This can be a proactive measure and solve the greater part of the problem. In other words, the possible solutions in form of policy recommendations would be outlined. For the purpose of those areas experiencing either hurricane or tornado, health tips are to be given to minimize casualties.

Definition of concepts

Natural hazard: It should be noted that, natural hazard and natural disaster are used as synonymous terms in this context. This is so because while some scientists view them as inseparable twins, others recognized natural disaster to be a byproduct of natural hazard, but with far-reaching unbearable negative impact than the natural hazard itself. Natural hazard refers to all atmospheric, hydrologic, geologic (especially, seismic and volcanic), and wildfire phenomena that, because of their location, severity, and frequency, have the potential to affect humans, their structures, or their activities adversely. Natural disaster, on the other hand, is a hazardous event that causes unacceptable large numbers of fatalities and/or overwhelming damage (OAS, 2014).

However, disaster in geophysical terms is not limited to damages associated with wind energy. Disaster is broadly divided into five major groupings: (1) geological disaster, e.g. avalanches, earth quakes, volcanic eruptions; (2) hydrological disaster, e.g. floods and tsunami; (3)

meteorological disaster, e.g. cyclonic storms, drought and tornadoes; (4) health disaster; e.g. epidemic and famines; and (5) space disaster, e.g. solar flares (Bankoff and Farkes 2003).

Hurricane: Hurricane has different names in different parts of the world. In the western Pacific Ocean, it is called typhoon. Hurricane that formed over the Indian Ocean, it is called cyclones (Holt Science and Technology, 2008). Sanjoy Chattarjee (2006) defined hurricane as "cyclonic storm, usually of tropic origin, covering an extensive area and containing winds in excess of 75 miles per hour". "Hurricane is an intense cyclone that develops over tropical oceans" (Mehta, 2010:52). Warm wet mass of air over the sea begins to evaporate. If the water is at 79^0 tropical or above, combined actions of air, water and heat produce a huge spinning system of clouds, rain and wind. Hurricane winds in the Northern Hemisphere circulate in a counter-clockwise motion around its eye. As for those in the Southern Hemisphere, they circulate clockwise. Natural phenomena affecting the storm include; temperature of water, the Gulf Stream, as well as steering wind currents. Hurricanes are mostly formed in the Atlantic Ocean, Gulf of Mexico, Indian Ocean, Caribbean Sea and Pacific Ocean.

Tornado:- "A tornado is a violently rotating column of air that usually touches the ground"(Spaulding and Namowitz, 2007:447)**.** Tornado is another cyclone but is much smaller in diameter than a hurricane. Tornadoes are about 100 meters to 1 kilometer (330 feet to 0.6 miles) in diameter, with wind speeds exceeding 200 meters (600 feet) per second. It is usually formed over land when cooler, drier air moves rapidly over warm, moist air. This creates an unstable condition, and the rising warm air creates a turbulent situation. Although tornadoes may occur at any time, they are frequently spawned in the spring. They are also associated with severe thunderstorms and may be produced on the fringes of large hurricanes (Mehta, 2010).

Development: the term development means different things to different people. However, development can take any of the following;

i. a significant change in biological organism, physical phenomenon, or individual's physiological and psychological state of being;
ii. a social transformation in terms of ideology, culture, and peace and harmony;
iii. national transformation in terms of technology and infrastructural facilities;
iv. fundamental modifications of the international economic, social and political systems;

v. A modification in one or all social institution(s): economy, politics, education, family, etc.

Broadly speaking, development as a form of evolution can be physical, social and biological as well.

Green House, Global Warming, and Hurricanes/Tornadoes

There is increasing evidence that hurricanes are getting stronger due to global warming. The number of Atlantic hurricanes that form each year has doubled over the past Century and global warming is largely to blame, according to a new study by scientists. The increases coincide closely with rises in sea surface temperatures in the eastern Atlantic tropics. Previous studies have attributed these rises to human emissions of greenhouse gases. That (correlation) implies there is a substantial contribution by greenhouse warming to the current crop of tropical cyclones [including tornadoes]. It has not been a steady, gradual increase (Roach, 2007).

The sunlight strikes the planet; most of the solar energy, about 70% is absorbed by the earth. Of the absorbed energy, some is radiated back as infrared radiation. Carbon dioxide (CO_2), a normal component of the atmosphere, traps part of this heat energy, like the glass of a greenhouse, and warms the earth. It has been estimated that without this greenhouse effect, the earth would be about 10^0 c (18^0F) colder. Human beings have been increasing the amount of CO_2 in the atmosphere by burning enormous amount of fossil fuels (oil and coal);fossilized remains of ancient forests, which we released their energy and turn them into CO_2 when we drive our cars and run our power plants. We also cut down the tropical rain forests that consume much of CO_2, burn them, and release even more CO_2 in the process. CO2 has increased by 25% since 1850 and the planet is warming up. This is an effect known as global warming. Warming will cause more water to evaporate from the oceans, increasing precipitation, hurricanes and other storms (including tornadoes). The frequency of hurricanes in the Atlantic and typhoons in the Pacific may already be increasing as a result of global warming.(Castro and Huber, 2007).

Positive effects of hurricanes and tornadoes on socio-economic development

Verily, in certain horrible events, come some benefits. In spite of catastrophic results to socio-economic development, hurricanes and tornadoes do have some positive effects too. These include:

1) The incidences of hurricanes and tornadoes are usually followed by copious amount of rain, which can be used for human use. It can be conserve for agricultural purposes-grazing farm animals, gardening, fish pond or environmental sanitation; treatment and consumption;
2) The water is also suitable for supplementing hydro-electrical power or energy generation. Power generation is a necessary feature of industrial society;
3) Society is prompt to device new technology to by tracking hurricanes' life by satellite and issuing watch and warning, and in case of tornado its radar is detected, predicted it and issue a warning for the people to be evacuated before the landfall. These are new developments meant to rescue lives and minimize cost of the disasters on our socio-economic development.

Hurricanes and tornadoes are very fascinating to track and to view on the satellite, but beyond the fascination there are some harsh realities.

Negative effects of hurricanes on socio-economic development

Hurricanes' effects: Hurricanes are among the most powerful and deadliest forces in nature, which brings various kings of effects to the areas it makes landfall. Tornado is the most destructive possible byproduct of a thunderstorm and hurricane.

1) Storm surge and tidal flooding are usually associated with hurricanes. Storm surge and tidal flooding lead to destruction of lives. For example, the greatest number of death in the history of the U.S. was at Galveston Island, Texas storm which took place in 1900. This storm surge produced by this hurricane killed 6000 people. The socio-economic

effects of such incidence is the possibility of rendering more thousands of people helpless dependents, widows/widowers, orphans and vulnerable, etc.

2) High winds are the most visible effects of hurricane since it determines how powerful the storm is and how much storm surge and damage it can cause. The hurricane winds create huge waves, which batter the shore. Wind in a hurricane can reach up to 200 MPH (miles per hour). The phenomenon can thus, lead to the destruction of homes, farm lands and trees, bridges, various physical structures. These damages require reconstruction and recovery and consequently, the problems of economic costs ensued. The costliest hurricane recorded was Andrew, August 1992. In less than two months of the year (1992), it hit two states: Florida and Louisiana and caused extensive damage to the areas affected. The damages were about $25 billion. Hurricane Iniki also affected three Hawaiian Islands resulting in over $1 billion damage. There is also the fear of famine, relocation of settlements and depression among population.

The Case study of Philippines

In 2011, more than 80% of all the deaths around the world caused by natural disasters occurred in Asia. The Philippines were the epicenter with 33 natural disasters, more than any country in the world. Typhoon Washi Claimed more than 1200 lives in late 2011. Super Typhoon Bopha Which Struck December 2012 took 900 lives. The super Typhoon Bopha packed winds of up to 100 miles per hour bringing torrential rains that destroyed villages and left 320,000 homeless. A total of 184 perished in Compostela Valley including 87 villagers and soldiers who died in a flash flood that swamped two emergency shelters and a military camp. Most of the typhoons' victims appeared to have drowned or been hit by falling trees or flying debris, officials said.

The eastern coast of Mindano, which was the area hardest hit by the storm, is a remote, impoverished agricultural area. There were tens of thousands of fallen coconut trees and many acres of destroyed banana plantations. Local television crews broadcast grisly footage of mug-covered bodies being loaded into trucks in villages that appeared flattened by the storm. In some areas, not a single structure could be seen standing (Laurence, 2012). Environmental hazard is accelerated by either human activities or natural disaster. As social scientists, our focal point is to study how humans exploit the environment while they disregard the possible short and long term

repercussions of these recurrent activities. As a result, environmental degradation, hazards and corresponding economic sufferings became the order of the day (Laurence, 2012).

Tornadoes' effects: It is worth noting that, tornado itself is also one of the least effects of a hurricane; tornadoes do occur in a hurricane as a result of tremendous energy and instability created when a hurricane makes landfall.

1) The tornado's winds propel objects through the air. The rotating column of air at the base of a tornado (i.e. twister) is visible because it contains either moisture or dust and debris which constitute ecological hazard.
2) As meteorologists classify tornadoes as weak, strong, or violent according to the Fujita scale. Weak tornadoes, which are most common, can put down trees or shift mobile homes off their foundations. The strong tornadoes rip roofs off houses, destroy or uproots large trees and lift cars. Violent tornado, which is rare, can destroy everything in its path, causing fatalities and doing millions of dollars' worth damage (Spaulding and Namowitz, 2007).

The Oakfield, Wisconsin Case study

A devastating tornado was spawned which struck Oakfield, Wisconsin, US on July 18th 1996. On that day, the town of Oakland was all but destroyed by the powerful tornado. The violent tornado developed in Fond du Lac County and moved southwestward across Wisconsin taking direct aim at Oakfield. At 7:15 pm the large tornado hit the 1000 (1,075 according to 2010 population census) person town, injuring 17 people. Its damage estimates totaled over $40 million as 47 of 320 homes were destroyed. In addition, 56 homes as well as numerous businesses and churches sustained heavy damage. The tornado picked up millions of empty cans and left them sprawled over a 50 mile distance. A state of emergency was declared by Governor Tommy Thompson allowing National Guard soldiers to come and aid victims and clear debris.

Besides structural damage to buildings, the tornado was quite costly to farmers; livestock, and farm equipments were also destroyed. The original National Weather Service report from Sullivan categorized the tornado to be an F3 to F4, winds of 158-261 mph, although it was later

upgraded to an F5,winds greater than 261 mph, the most possible severe tornado. F5 tornadoes are very rare, only occurring on average, every other year in the United States (CIMSS, 2014).

Safety tips during the Hurricanes

Gather a portable radio, fresh batteries to listen to weather updates. Keep a flashlights, drinking water, food, and medicines. Set refrigerator to high and open only if necessary. If you are outside, at a shore or in boat, secure loose objects, shutter or board up windows and secure doors; if in a mobile home; check tie-downs and go to a shelter; have a flood-free evacuation route planned immediately and shut off water and electricity.

During the hurricanes, stay indoors and away from windows. After the incidence, beware of downed wires, unsafe roads, flooded areas, animals sheltering indoors, and broken gas lines

Safety tips for Tornadoes

Stay or go indoors. If possible, go quickly to a basement or storm cellar. Otherwise, go to a small inner hallway or room without windows, such as bathroom or closet, on the ground floor of a building. Avoid large spaces like auditoriums and malls. Stay away from windows and outside walls. Get under a mattress or sturdy piece of furniture and hold onto it. Protect your head and neck. Avoid mobile homes and cars. If you are caught outside, lie in a ditch or low-lying area. Protect your head and neck and set a watchful eye because of flooding.

Conclusion

It could be concluded that, the labeled environmental disasters or natural hazards are not always natural. Human activity cannot be directly said causes hurricanes and tornados, but studies have revealed that hurricanes and tornadoes are increasing because of global warming. The rise in frequency of hurricane and tornado, as well as other environmental hazards, is therefore directly or indirectly related to greenhouse effects and excessive emission of CO_2.

We shall re-evaluate our activities to have sustainable environment because if the environment is uncomfortable with the way and manner in which we temper with it, it will be very difficult for us to be comfortable with the ecosystem and by implication, socio-economic development is not obtainable. Forest, for instance, is an eco-system that offers goods, including trees that provide lumber, fuel, and fruit. The forest may also provide services in the form of water storage and flood control wildlife habitat, nutrient storage, and recreation. But deforestation for energy, agriculture, or for housing had become a common act and we must check it.

More so, like other environmental disasters, hurricanes and tornadoes usually lead to unprecedented damages, making people unable to cope with socio-economic depressions and losses; destruction of farm lands, trees, population displacement because people desert their usual places of living before or at the aftermath of the incidences because hurricane and tornado can sweep everything they come to pass.

Policy Implications

Although, development of new technologies by humans is a necessary criterion for the shift of civilization from primitive to modern or for movement of society from simple to complex, but it is not necessary for technological development to harm our environment and destroy earth's resources. And however, humans can do little or nothing to change the incidence or intensity of most natural phenomena, they have an important role to play in ensuring that natural events are not converted into disasters by their actions. Organization of American States (2014) observes that human intervention can participate in three ways to cause or accelerate one environmental hazard or the other. These are: 1) humans can increase the frequency and severity of natural disaster; 2) humans may also cause natural disaster where none existed before; 3) humans can reduce the mitigating effect of natural ecosystems. If human activities can cause or aggravate the destructive effects of natural phenomena, they can also eliminate or reduce them.

As environmental movements are being formed, green parties are also emerging in various developed nations to reverse the vulnerability of the environment (Henslin, 2010). But it is unfortunate that, people in developing nations are not aware of such development. More environmental activisms are needed everywhere in the world. Governments should review and enforce their environmental protection laws. Industrialized nations, local and transnational

corporations must adapt to environmental justice ideals not to make the poor population the only victims of pollution by industrial capitalism. The most industrialized nations are like China and the United States are the highest polluters of and users of energy world but, ironically, the two nations are totally not in support of effort to tackle the problems. After 1997 Kyoto Climate Change Conference among 141 countries agreed to a reduction below 1990 levels in the emission of Carbon dioxide and greenhouse gases by 2012. To do so, industries and consumers alike must cut their use of fossil fuels. A major setback took place when the US and China withdrew from the Kyoto agreement and do not abide by the agreement. Governments of countries with fragile ecosystem should be making environmental planning by diagnosing the needs of an area and identifying the resources available to it, then using this information to formulate an integrated development strategy for proactive projects.

At the end, we close with assertion that, the more developed a country's planning institutions and processes are strategically articulated, the more easily natural hazards assessment and mitigation of disaster can be successful and, indeed, the more the likelihood for such country to achieve peace, stability and a sound socio-economic development.

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