APPLICATION OF METEOROLOGY AND WEATHER PREDICTION IN THE SUSTAINABLE ENVIRONMENTAL QUALITY IN NIGERIA

Ojo, M. O.
Department of Physics
Adeyemi College of Education, Ondo, Nigeria
E-mail: *mthwojo@yaho.co.uk*

Olanusi, O. B.
Department of Geography
Adeyemi College of Education, Ondo, Nigeria.

Akinnubi, R. T.
Department of Physics
Adeyemi College of Education, Ondo, Nigeria.
E-mail: *rufus782000@yahoo.com*

ABSTRACT

In the past few decades, the perilous socio-economic effects of meteorological hazards were exemplified by drought, desertification, flood, storm surges, erosion, landslide, harmattan haze, line squalls and thunderstorms, tornadoes and heat waves. These were sadly concerned as observed on the lives of the citizens of Nigeria. It is saddening to note that weather hazards are evidently becoming an ever-greater part of the daily lives of our people and must not be over-looked. Therefore, Studies on the potential impact of climatic change on man and his environment have become very crucial in contemporary scientific research. Because, human health, energy and comfort are affected by climate than any other element of the physical environment. This study examined the impacts of meteorology and weather prediction in the process of national transformation. The development and challenges of modern prediction with special focus on tropical weather system are examined. The paper concludes that there is a pressing need to improve our conventional methods of weather forecasting through more up-to-date and powerful techniques such as weather prediction, monitoring and processing by the use of radars, satellites and computers.

Keywords: *Meteorological hazards, weather, forecast, Natural disasters, weather elements and climate.*

INTRODUCTION

In recent times, the world has became aware of the increasing degree of devastating and insecurity of lives and properties by meteorological hazards and the resultant impacts on the socio-economic development of Nations. Over the last couple of years, the existence of hazards such as droughts, desertification, storm, floods, global warming, hurricanes, acid rain , erosion and so on are very rampant and have become one of the world's major topical subjects. These hazards are giving the present generation much concern owing to their renewed intensities. In the United States and the Caribbean, several thousand of lives and property have been lost through the occurrences of hurricanes and tornadoes. The ravages of tropical storms in India,

Bangladesh and Pakistan are still annual events each time sweeping away whole villages and destroying crop-lands (Musa, 1991). Therefore, the in-depth understanding of these two salient phenomena, Meteorology and weather prediction will go a long way towards effective transformation of our nation. They provide useful information associated with understanding many aspects of our atmospheric behaviour. Meteorology is the study of the earth's atmosphere and the weather which occurs in it. Meteorologists gather and analyze information on atmospheric conditions. They attempt to spot and interpret trends, understand the weather of yesterday, describe the weather of today, and predict the weather of tomorrow.

Weather can affect us in numerous ways, drought results in water shortage, increase wild fire potential, and crop damage. The critical impact of weather on human lives led to the best known applications of meteorology and weather forecasting. These essential information are very useful in agriculture, air-pollution, sea and air transportation, and in the study of trends in the earth's climate such as global warming and ozone depletion (Ojo, 2004). The earlier story of Noah and the Ark is another pointer to weather prediction event of the past and the devastation of the world by weather hazards (Adejokun, 1991). Many studies made earlier have been related to similar issues such as meteorological hazards of floods, droughts, desertification, water vapour budget, urban planning settlement etc. (Adejuwon, 1991; Adejokun, 1991; Bjerkus, 1998; Abba, 2004; Omotoso et al. 2000 and Orji and Gbuyiro, 2009).

The main objectives of this paper are to clearly examine how meteorology and weather prediction can be used to understand many important aspects of atmospheric behaviour and climate change. Significantly, it has tried to educate the people on the major contributions and roles of meteorology and weather prediction on the protection of life and property, and the needs for forecasts and warning for maintaining environmental quality. The paper further sheds light on the implications of understanding the salient issues, the societal needs in the process to stimulate constructive and open dialogue within the atmospheric sciences community about its relation to the broader society.

Adverse Effects of Meteorological Hazards and Climate

The state of the atmosphere and the climate are characterized by combinations and variations of a series of parameters, which are the elements of the weather. These various parameters have in turn, affect human body, health, properties, crops, animals and other useful resources. The effects of these parameters become more deleterious in the already weak economies of many African countries, compounded by the debt situation as well as declining agricultural production and productivity. Indeed, the implications are not just to agriculture but to other sectoral areas of importance to society as well. Many meteorological and hydrological hazards are linked to major natural disasters. Singh (1983) reported in his study of the ten major types of rapid onset disasters on lives lost throughout the world.

Type of Disaster	*Number of Deaths*
Tropical cyclones and hurricanes	499,000
Earthquakes	450,000
Floods	194,000
Thunderstorms and tornadoes	29,000
Snowstorms	10,000
Volcanoes	9,000
Heat waves	7,000
Avalanches	5,000
Landslides	5,000
Tidal waves	4,000

Source: Singh (1983). Blackweeks. *Disasters,* 7,202 - 209 .

It can be noted that seven of these phenomena are weather related. In particular, tropical cyclones and floods occur frequently over large areas and affect hundreds of millions of people. Floods produced by meteorological hazards such as tropical cyclones, severe thunderstorms or prolonged rainfall not only damage property, but also take a regular toll of life in many countries. These problems are being aggravated by the growth of development and settlement in flood-prone areas. The economic and social destruction produced by floods can be illustrated by an example from Africa. In this region, the estimated average annual cost of floods damage amounts to over US$300 millions. This put an enormous strain on financial resources. The value of the human lives lost is incalculable (Obasi, 1991).

Considering the Nigeria situation, in the 80's floods caused by Ogunpa River in Ibadan claimed lives and property. Recently, floods were reported in Osogbo, Ibadan and other parts of the country, which are also responsible for the destruction of lives and valuable properties. Moreso, many people are rendered homeless. Drought is generally viewed as a sustained and regionally extensive occurrence of appreciably below average natural availability of water either in the form of precipitation, surface water run-off or ground water. Obasi (1991) observed that drought is a hazard caused by longer period climatic fluctuation with immense implications. Drought prone areas are characterized by extreme dryness and lack of convective activity and other forms of atmospheric disturbances such as squall lines which are part of the general circulation of the atmosphere.

Meteorologists and climatologists are well aware of the fact that the weather systems that affect drought-prone areas are very complex and they are caused by fluctuations in the global atmospheric circulation. The most significant of these fluctuations and the resultant catastrophic impacts have been observed in the tropics and sub-tropics, especially in the African region where the largest land mass in the tropics and sub tropics is located. Anthropogenic forces associated with land use practices (deforestation and overgrazing) tend to modify the surface reflectivity (albedo) surface roughness and moisture convergence. These affect the feedback on moisture recycling mechanisms that is reduction in soil moisture leading to reduced

evaporation, hence, available atmospheric moisture or water vapor for cloud formation. The presence of a deep layer of dust in the lower troposphere also reduces incoming solar radiation and hence convective activity occurs. The effect of the climatic change on the agricultural sector over the last thirty-eight years has been largely negative, giving rise to dwindling contribution of agricultural sector to the National gross domestic product, yearly increase in the amount spent on food importation and ever increasing composite prices of food. Thompson and Amos (2009) reported that the clear situation of food insecurity is a result of climatic change in Nigeria.

Climate and its variability also affect many aspects of socio economic development of the nation. Omotohso, Baloguun and Ogunjobi (2009); Obasi (1991) asserted that the projected global climate change due to greenhouse effect warming would be an unprecedented event in the history of human civilization. It is the rate of change that makes us to consider future climate change as a hazard, since ecological and socio-economic systems would find it difficult to adapt to it without serious implications. Future climate change is very often referred to as climate warming. Changes in the atmospheric concentration of greenhouse gases would lead to warming near the earth's surface and in the troposphere. Change of global climate may be characterized by the global mean temperature, which is estimated to rise according to Obasi (1991), between 1.5^{o}C to 4.5^{o}C by the year 2030, when the amount of the greenhouse gases in the atmosphere is expected to double. The resultant effect is that other meteorological and hydrological variables will change. This can lead to changes in frequency, magnitude and location of such hazardous phenomena as floods, storms and droughts, Sea level rise associated with this warming will constitute a serious hazard for many islands and low lying coastal areas.

CONCLUSION AND RECOMMENDATIONS

This paper examines the potential impacts of climate change on man and his environment and the effects of the meteorological hazards and weather prediction in the process of national transformation. In the course of transforming Nigeria in all ramifications such as political, social, economical and technological; meteorological hazards and weather prediction play important roles. The development of modern technology and early warning systems for mass preparedness will reduce the incidents of such hazards. Among other things, the formulation of national programmes is encouraged. The National Meteorological and Hydrological Services should promote activities under such national programme to focus on hazards prediction, risk assessment, disaster preparedness and disaster mitigation.

National transformation can only be achieved by implementing major changes in managing the environment, and should involve a new environmental psychology. There is the need to think about economic change and society's relationship with the environment. It is important that the government and policy makers recognize the fact that positive transformation and development cannot be achieved without considering the environmental consequences of any action.

This paper has presented some meteorological hazards and their consequent threats to the society and its development at large. Since these hazards are naturally inclined, a natural question that come to the mind of every individual is that: Is there any solution to the problems? It is generally observed that the impact of natural hazards are increasing and will continue unless drastic actions are taken on the parts of scientists, researchers and governments. Natural disaster may be described as a serious disruption of the functioning of a community caused by a natural phenomenon provoking widespread human and material losses.

Therefore, the following recommendations are made: many lives could have been saved, suffering and property damage would be reduced if warning and prepared arrangements are considered. Then Nigeria Meteorological and Hydrological services should provide vital service by their issuance of appropriate forecasts and warnings. Efforts to mitigate the effects of flooding, in some cases produced by the combination of river flooding and storm surges have thus become increasingly important. Flood forecasting is recognized as the most cost-effective non-structural means of reducing loss of life and damage to property. Hopefully, adoption of meaningful analysis will help to improve the accuracy of weather forecasting for extended periods and also in studying the factors that determine the statistical properties of the general atmospheric circulation which would lead to better understanding of the physical basis of climate and the incidence of drought. Government should earmark special fund to the existing organizations such as World Meteorological Organization (WMO), Nigerian Meteorological Society (NIMETS), Nigerian Department of Meteorological Services etc. for the purpose of climate and atmospheric studies. The World Meteorological Organization has the responsibility within the United Nation systems for activities relating to meteorology, climatology and operational hydrology so that relevant research results should be disseminated in dispatch through conference, seminars, workshops and symposia.

There is a pressing need to improve our conventional methods of weather forecasting through more up-to date and powerful techniques such as weather prediction, monitoring and processing by the use of radars, satellites and computers. More so there is an urgent need for a local development of an appropriate instrumentation technology by Nigeria as a nation.

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