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Website: www.aarf.asia Email : editor@aarf.asia , editoraarf@gmail.com

CLIMATE CHANGE: MEANING, CAUSES, PROBLEMS IN THE TROPICS AND STRATEGIES TO COPE WITH THE CHANGE

CHUKWU, KEVIN EJIKE Ph.D.

Department of Geography and Meteorology, Faculty of Environmental Sciences

Enugu State University of Science and Technology (ESUT), Enugu State

OKWUDELUNZU, VIRGINIA UGO

Department of Geography and Meteorology, Faculty of Environmental Sciences

Enugu State University of Science and Technology (ESUT), Enugu State

Abstract

This study was carried out to evaluate climate change, with specific reference to the meaning, causes, and problems in the tropics and strategies that can be used to cope with the changes. The objectives of the study was to identify the major causes of climate change, identify the major negative impacts of climate change within the tropic and to identify major adaptive or mitigation measures for climate change. The study utilized abstraction of information from published and unpublished sources, such as newspapers, magazines, Journals. The study revealed that climate change may be due to natural or internal processes or anthropogenic changes in the composition of atmosphere, it was also revealed that climate is dynamic and always changing through a natural cycle, but the changes as what is happening today is being speeded up, because of man's activities. Problems of climate change in tropics are among other things increase in rainfall, decrease in rainfall, increase in fertilizer application. It was as well revealed that the most effective and least expensive strategy to cope with climate change is to avoid floodplains entirely in constructing houses for human habitation, since there is no way to completely eliminate possible damage. The study therefore recommended that there should adequate warning system, and that efforts should be made to avoid locating people and structures in areas where high intensity hazardous occurrences are expected or limit the total exposure people to such hazards.

Keywords: Climate Change, Meaning, Causes, Problems, Tropics, Strategies, Cope

Introduction

Climate change or global warming is now recognized as the greatest and most serious environmental challenge facing the world in the 2 1st century, to the extent that global warming issues now top the world agenda (Ghazi, 2000). Manifestation of the climate change are wide ranging in various parts of the world include; higher frequency of formation of cyclonic storms, higher intensity of rainfall along with changing precipitation patterns, and prolonged drought. Others include hurricanes. Along with related landslides and wildfire. (Intergovernmental panel on climate change, 1996). Global warming is due to increasing concentrations of greenhouse gases (GHGS) it poses threats to human society by changing the living and working environment to which society has adapted over the generations (Jodha, 1992). On the global scale, the rate and magnitude of predicted changes in climate are unprecedented in historical times. This establishment severity therefore, raises questions about their likely effects on physical resources, natural ecosystem and human activities, especially with reference to future developments. They also raise the question of measures, if any, that there are for presenting the most serious impacts (Nwafor, 2006)

Climate change issues are of worldwide significance. The projected changes are predicted to have adverse consequences for many regions of the world, impacting on water resources, agricultural productivity, and natural marine and terrestrial systems. Other areas projected to be impacted are coastal zones, human settlements and human health, infrastructure and industry (Mimura et al, 1998). However, countries within the tropics are particularly vulnerable to climate change impacts which are occurring when these countries have little adaptive capacity. The reason for the shortage of adaptive capacity is the lack of scientific, technical, financial and institutional capacity to evaluate the impact of climate change.

Based on the above, it is very necessary that researches should move in to find urgent adaptive or mitigation solutions to climate change havoc. It is, also necessary that funds and more efforts globally should be provided to tackle the problems associated with global warming worldwide, even though the impacts are more felt within the tropics where most of the least developed counties of the world are domiciled.

Statement of the Research Problem

The impacts or effects of climate change vary from one region to another, but the impacts of the change are more damaging within the tropics than any other part of the world. The simple reason is the fact, that this area of the world lacks the adaptive capacity, such as, scientific, technical, financial or institutional to evaluate the impact of climate change. These constraining factors also make it difficult to implement adaptation measures (Nwafor, 2006)

Researches have shown, that some of the factors that encourage climate change are man-induced, such factors are burning of fossil fuels which release more carbon-dioxide into the atmosphere, intensive agricultural and industrial processes also tends to vomit more greenhouse gases (GHGS) into the atmosphere, increase in human population also assists through sewage disposal, deforestation and nitrate enrichment of rivers (Peierls et al, 1991)

The emergency of petroleum which was used before became useful as energy for industries, engines at homes is another source of encouragement for emission of greenhouse gases (GHGS) into the sky. The emergency of Industrial Revolution in the 18th century opened the way or greenhouse gases to move into the atmosphere.

Methane which is another source of greenhouse gases (GHGS) comes from domestic animals, such as dairy cows, goats, pigs, camels, horses, sheep, buffaloes etc.

Other natural causes of climate change, include, continental drifts, volcanoes, earth tilting and ocean currents. Man-induced factors can be reduced or stopped, but natural factors that cause climate change would be difficult to be stopped

Aim and Objectives of the Research:

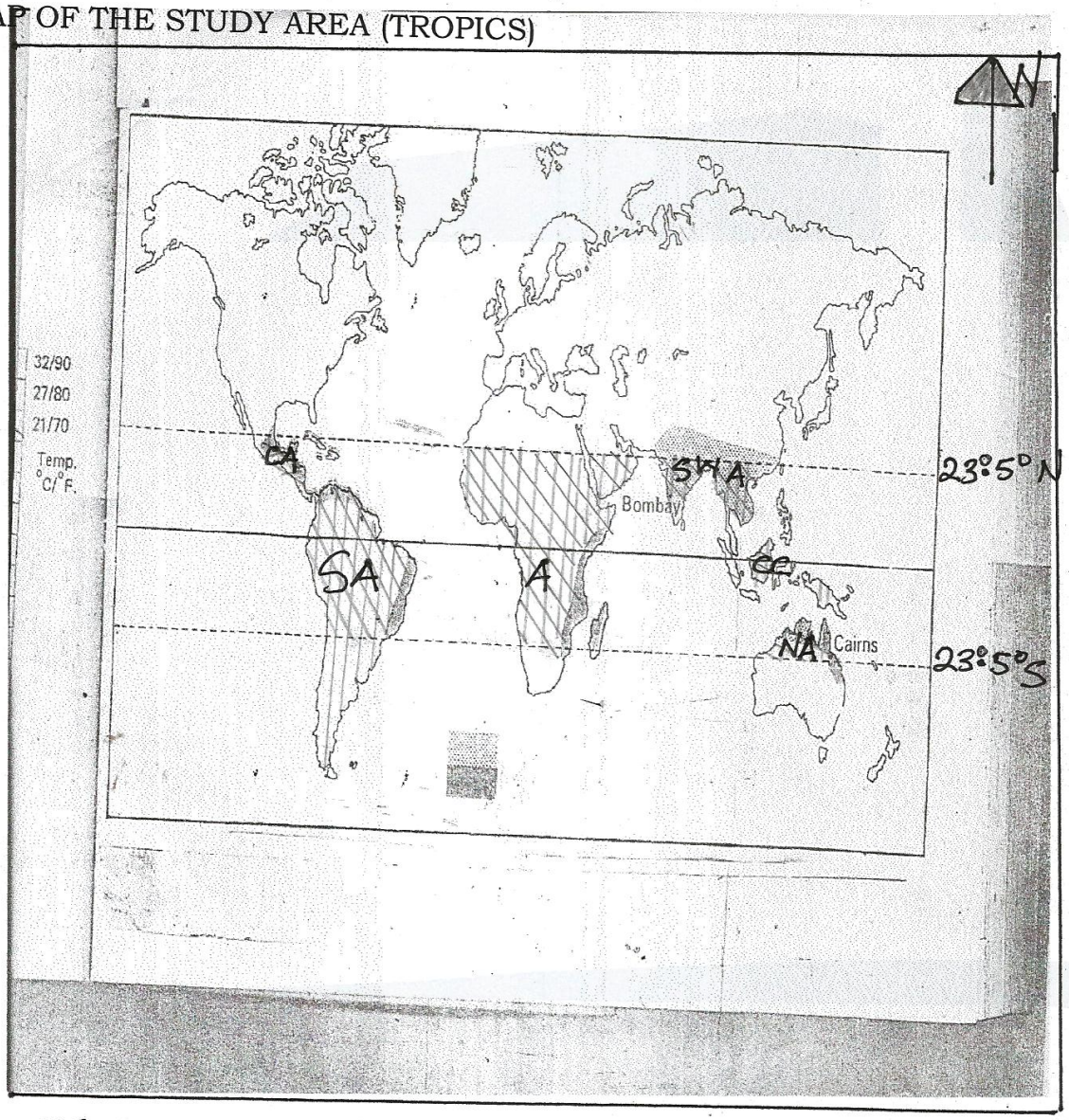
This research seeks to identify the causes of climate change within the tropics, while the specific objectives of the research are as follows:

- **i.** To identify the major causes of climate change.
- **ii.** To identify the major negative impacts of climate change within the tropics
- **iii.** To identify major adaptive or mitigation measures for climate change

Study Area

Tropics lie between latitude 23°5” (north and latitude 23°5” (south of the equator. Tropics lie between the tropic of cancer and the tropic of Capricorn. It is bordered in the north by Arctic Circle (66°5”°N) and in the south by Antarctic circle (66°4s). Tropics cut across many continents, such as, South America, Central America, Africa, Asia and Australia. These regions lie within the tropics. Tropics experience equatorial, hot and wet climate (plate 1).

PLATE I:
MAP OF THE STUDY AREA (TROPICS)



KEY

CA	CENTRAL AMERICA
SA	SOUTH AMERICA
A	AFRICA
SWA	SOUTH WEST ASIA
CC	CARRIBEAN COUNTRIES
NA	NORTHERN AUSTRALIA

SOURCE: ENUGU STATE MINISTRY OF LANDS AND SURVEY 26/01/2014

Geology of the Study Area

Geologically, the tropics consist of several extensive plateau surfaces, including Jos plateau (Nigeria) Fouta Djallon Highlands (Guinea) Mountain Mayon (Philippines), mountain Merapi (Sumatra), mountains Cotopaxi and Chimborazo (Ecuador), mountain kilimanjero, Elgon mountain and mountain Rewenzori, all in East Africa. Mountain Paricutin in Mexico is also w4hin the tropics.

Drainage:

In the tropics there are many rivers with unequal sizes and importance. The following rivers could be identified within the tropics. The rivers are as follows, River Niger (Nigeria), River Zaire (Democratic republic of Congo), River Hwang-Ho (china), River Yang-tze kiang (china), River Amazon (Brazil), River Mekong (Laos), River Pra (Ghana), River volta (Ghana) and River Rokel (Sierra leone. The above rivers play vital role in their respective countries and are also useful in watering of agricultural farms as well as provisions of various types of fish for.

Soils

Soils in the tropics are mainly ferrallitic and are rapidly leached and easily exhausted. Based on FAQ, genetic classification system. The four major groups of soils in the tropics are as follows: the hydromorphic and organic soils which developed, notably along coasts and river flood plains. The regosols and brown soils developed on drift and continental sedimentary deposits. The ferralsols developed essentially on sedimentary rocks and the highly ferruginous tropical red and brown soils of the basement complex rocks. These are the basic soils within the tropics.

Climate and Vegetation

The climate in the tropics has a great uniformity of temperature throughout the year. The mean monthly temperatures are always around 800F, with very little variation. Cloudiness and heavy' precipitation help to moderate the daily temperature, so that even at the equator itself, the climate is not unbearable. Both the diurnal range of temperature and annual range is very small. Relative humidity within the tropics is very high. There is a regular land and sea breezes here, especially along the coastal areas. The annual range of temperature here hovers around 30F the basic cause of the climate here is the difference in the rate of heating and cooling of land and sea.

This area supports very luxuriant type of dense vegetation, because of heavy rainfall. There is a great variety of vegetation in the tropics. There is a multitude of ever green trees that yield tropical, hardwood e.g., mahogany, ebony, greenheart, cabinet woods and dyewoods. There are smaller parasitic plants here

and under the trees, grow a variety of creepers, ferns, orchids and lalang. Trees here may altain a height of 60m (150 feet). It is important to note that the trees here are not found in pure stands of single specie Hauling of tropical hardwood here is difficult because many of the hardwoods cannot float easily. Many parts of the rain forests in the tropics have been cleared either for numbering or for cultivation and the clearings when abandoned, less luxuriant secondary forests spring up.

Rainfall and Temperature

Precipitation is very heavy within the tropics. Precipitation is between 1524 millimeters and 2699 millimeters (6Olnches-106 Inches) and well distributed throughout the year. There are two distinct seasons here-the wet or rainy season and the dry season. Heavy rains are recorded during the rainy season while, little or no rain is recorded during the dry season of the year.

Rainfall decreases both in duration and in amount from coastal areas to the interior, except where altitudinal effects create Islands of higher rainfall (Oguntoyinbo, 1978) Due to the great heat in the tropics, mornings are often bright and sunny and there is much evaporation.

The most outstanding feature of this region is its great uniformity of temperature throughout the year. The mean monthly temperatures are always around 80^{o}F with very little variation cloudiness and heavy precipitation help to moderate the daily temperature. The annual and diurned range of temperatures in these regions is not more than 4^{o}F.

Human Activities and Land Use

The tropics is fast growing or changing and many types of economic activities are going on within this region, Major economic activities going on in the tropics are; farming, lumbering, trading, fishing, banking, etc. There is another group of people involved in service occupations, members in this group are not producers in the strict sense. These people in this group are mostly doctors, lawyers, musicians, civil servants, religious preachers, bankers and law enforcement agents.

There are groups of people who engineer the movement of goods and people, from places to places, these people are known and called transporters.

Educational Land Use

The number of educational institution is increasing yearly in each country within the tropics. There are millions of primary, secondary and tertiary institutions within the tropics. Some institutions are publicly owned and privately owned in each country within the tropics, it is not wrong to claim that there are millions of primary, secondary and tertiary schools throughout the tropics. There are also thousands of

both research institutions and specialized institutions. There are also many military institutions within the tropics.

Residential Land Use

Within each country in the tropics, there are millions of both rural and urban centres with varying human populations. Capital of each country has the largest urban population. There are more rural areas within the tropics than urban areas. There are millions of residential houses in the tropics.

Population

More than ninety percent of the lea9t developed countries of the world reside within the tropics and more than half of human beings on earth reside within the tropics (Nwalor, 2006). The two most populous countries of the world are domiciled within the tropics. By 1994, the 20 largest countries in tropics consist of 3,067 billion inhabitants (weeks, 1994). The two most populous nations of the world today, china and India are domiciled within tropics. The human population within the tropics is expanding at an alarming rate.

Literature Review

Today, there are many works on climate change, and more researches are still going to find mitigation measures. This is strong evidence that climate change is a reality and not a myth. The impacts of climate change vary from least developed countries to developed countries.

Climate change can make ecosystem that is stable, such as, sahel savanna become vulnerable because warming will reinforce existing patterns of water scarcity and increasing the risk of drought in most countries of West Africa (IPCC, 2007). Climate change has brought about severe and possible permanent alterations to our planet's geological, biological and ecological systems (Intergovernmental panel on climate change, (2003).

A report on the global human impact of climate change, published by the global Humanitarian Forum in 2009, estimated that more than 30,000 deaths and indicated that the high mortality is due to worsening floods and droughts in developing countries.

Scientists have high confidence that global temperatures will continue to rise for decades to come, largely due to greenhouse gases produced by human activities. The intergovernmental panel on climate change (IPCC) forecasts a temperature rise of 2.5-10 degrees Fahrenheit over the next century.

Global warming and climate change issues are of worldwide significance. The projected changes are predicted to have adverse consequences for many regions of the world, impacting on water resources,

agricultural productivity, natural marine and terrestrial systems, others are coastal zones, humans settlements and human health, infrastructure and industry (mimura, et al, 1998). Global warming is due to the increasing concentrations of green gases (GHGS) and poses threats to human society by changing the living and working environment to which society has adapted over the generations (Jodha, 1992). There is a great disparity or bearing on the nature and degree of contributions by the developed and developing regions of the world to climate change (Pachauri, Taniguchi and Tanaka Eds, 2000). Developing countries currently emit less GHG.S per capita and have, contributed less to pass emissions (Reid and Goldernberg, 1997).

Research Methodology

This study will involve abstraction of information from published and unpublished sources, such as newspapers, magazines, Journals. Internet will be visited to collect more information.

Climate Change, Meaning, Causes, Problems

Climate Change and its Meaning

Climate change refers to an increase in average global temperatures. Climate change is an alteration in average weather conditions. Climate change in the statistical properties of the climate system, when considered over long periods of time regardless of the cause. It is synonymous with global warming. Climate change is a long-term change in the statistical distribution of weather patterns over periods of time that range from decades to millions of years. It is not wrong to say that climate change is the increase in the average weather condition of the earth's surface (0-600KM).

Causes of Climate Change

Man induced climate change:

Climate change may be due to natural or internal processes or anthropogenic changes in the composition of atmosphere. The earth's climate is dynamic and always changing through natural cycle. The worrisome aspects of this change are that it has speeded up today unlike many years back, man's activities. Today there has been an increase in the concentration of greenhouse gases. (GHGs), in the atmosphere as a result of man's activities. Today, billion tons of GHGs are being released into the atmosphere every year and their concentrations have steadily increased in the recent past. These days, concentration of carbon dioxide (Co_2), methane (CH^4) and Nitrous Oxide (N_20), Nitrogen Oxides (N0x) and carbon monoxide (CO) are not greenhouse gases but, have an influence on the chemical cycles in the atmosphere that produce or destroy greenhouse gases. It is important to know that emission of Co_2 far exceed those of

methane (CH^4) and Nitrous oxide (N_20) methane (CH^4), carbon dioxide (Co_2) and Nitrous oxide (N_20) occur naturally and their concentration is influenced by human activities (Warrick et al, 1983). In the last two centuries human activities, such as, the combustion of fossil fuels (gas, coal, wood, petroleum) and changes in land use account for anthropogenic CO_2 emissions. Agriculture and clearing of forests are responsible for human generated CH^4 (methane) emissions and N_20 emissions.

Today, more and more lands that were covered with vegetation are being cleared to make way for houses. Natural resources are being used extensively for construction, industries, transport and consumption, human population has also increased tremendously. All these increases tend to increase greenhouse gases (GHGs) in the atmosphere. Fossil fuels (Coal, natural gas, oil etc. supply most of the energy needed to run vehicles, generate electricity for industries, households etc., the energy used is responsible for 75 percent of the carbon dioxide ($C0_2$) emissions, 20 percent of methane (CR^4) emissions and some quality of nitrous oxide (N_20) The energy we use also produces nitrogen oxides (N_20) and, carbon monoxide (CO) which are not greenhouse gases, but have influence on the chemical cycles in the atmosphere that destroy greenhouse gases.

Changes in land use pattern, deforestation, land clearing, agriculture and other activities have all led to a rise in the, emission of carbon dioxide ($C0_2$). Methane is another important greenhouse gas in the atmosphere. About 20-25 percent of all methane emissions come from domesticated animals-such as, dairy cows, goats, pigs, buffalos, -camels, sheep, horses etc. These animals produce methane during the cud-chewing process. Methane is released from rice or paddy fields that are flooded during the sowing and maturing periods when soil is covered by water, it becomes anaerobic or lacking in oxygen. Under these conditions, methane produce 'bacteria and other organisms decomposes organic matter in the soil to form methane. Methane is also produced from landfills ad dumps of wastes. Its waste is put into an incinerator or burnt in open, carbon dioxide ($C0_2$) is emitted. Methane is also emitted during the process of oil drilling, coal mining and also from leaking gas pipelines. Fertilizer application also emits nitrous oxide.

Natural Causes of Climate Change

The earth's climate is dynamic and always changing through a natural cycle, but the changes as what is happening today is being speeded up, because of man's activities.

A. Continental Drift: Geologically, it has been proved that South American and Africa once belonged to one large land-mass about 200 million years ago. In other words, the two continents were' joined together. The two continents in about million years drifted apart and became separate continents called Africa and South America

B. Volcanoes: when a volcano erupts, it throws out large volumes of sulphur dioxide (So_2), water vapour, dust and ash into the atmosphere. Millions of tons of So_2 gas can reach the upper parts of the atmosphere (Stratosphere) from a major eruption. The gases and dust can successfully block the incoming rays of the sun which leads to cooling. Droplets of sulphuric can stay aloft for several years in the stratosphere and are good reflectors of the energy from the sun (sunlight). Thousands of tons of gases will easily reduce the amount of solar radiation reaching the earth's surface, lowering temperatures in the lower levels of atmosphere called troposphere.

The Earth's Tilt: the earth makes one full revolution around the earth in every year. The earth travels on an orbit at a speed of 30km (18.5 miles). One• mile is about 1.6 km per second or 6,000 miles per hour (MPH) and one complete revolution takes 365days in one year. The earth is tilted at an angle of 23.500 to a plane of its orbital path. For one half of the year, when it is summer, the northern hemisphere tilts towards the sun and when it is winter, the earth is tilted away from the sun, if there, were no tilts, automatically, there would be no reason. More tilts means warmer summers and colder winters and less tilt means cooler summers and milder winters. The distance between the earth and the sun varies at different times of the year.

Ocean Currents: The Ocean covers about 71 percent of the earth and absorbs a lot of the sun's radiation. An Ocean current moves vast amounts of heat across the planet. The influence of ocean currents is always uneven. In other words, certain parts of the world are more moved by oceans currents than others. For example, the coast of peru in south America is strongly influenced by humbolt current. Another region that is strongly influenced by ocean currents is the North Atlantic. The effect is obvious when places located in Europe and North America are in the same latitude are compared.

Problems of Climate Change in the Tropics

i. Increase in Rainfall: one of the problems in climate change is increase in the amount of rainfall which can lead to the displacement of human settlements.

Increase in the amount of rainfall equally can lead to over flooding especially along coastal areas or along floodplains. This can also lead to increase in run-offs which can have adverse effects on the environment and some coastal areas may be submerged.

ii. Decrease in Rainfall: Decreases in amount of rainfall, especially in northern parts of the tropics can easily lead to poor crop yields or poor forest growth. Consistent poor crop yields, can force many people

to out-migrate to a better and more conducive environment, where crops can be grown and forest growth is encouraged, because of conducive weather.

iii. Increase in Fertilizer Application:

Decrease in crop yield which is as a result of a decrease in rainfall will attract high fertilizer application to increase crop yield. More demand for fertilizer usage can lead to emergence of more fertilizer producing factories or firms in the tropics.

vi. Increase in Run-Off as A Result of Increase in Run-Offs: Increase in run-offs caused as a result of increase in amount of rainfall means that more fertilizer would be carried into water bodies, or rivers or streams.

v. Increase in Fertilizer Demand: Increase in fertilizer demands means that more fertilizer factories or firms need to be established to cater for the increasing demand of fertilizer from formers. .

vi. Decrease in Rainfall: Decrease in rainfall as a result of climate change will automatically lead to a decrease in the quantity of food available for human consumption.

vii. Rise in Average Temperature:

Rise in average temperature occasioned by climate change is an automatic invitation to desertification of the environments and moisture stress. Moisture stress means that more and prolonged drought is likely to be the outcome.

viii. Increased Intrusion of Salinity: Increase in sea or river rise means that a corresponding increase in salinity intrusion is expected. Salinity is the degree of saltiness of water.

ix. Extreme Rise in Average Temperature: Exposure to thermal extremes such as, heatwaves,

Impacts of Climate Change: Climate change impacts both in the society and ecosystems in a broad variety of ways, for e.g. climate change can increase or decrease rainfall, influence agricultural crop yields, affects human health, causes changes to forests and other ecosystems or even impact the energy supply. Climate- related impacts are occurring across region of the country and across many sectors of the economy. Climate change impacts the society in the following ways:

Ocean, sea, river rise through submergence of areas, can cause the loss of agricultural production and income. It can also cause relocation and or destruction of homesteads and fixed assets. It can lead to full

destruction and abandonment of infrastructure. Protection of destroyable assets can be carried out at a high cost in many areas.

Increased precipitation which enhances floods can lead to loss of infrastructure, such as, roads, settlements and educational centres. It can also alter crop calendar which will lead to crop losses or failures.

Increase in high average temperature will lead to loss of agricultural production, income, increased hunger and malnutrition. Higher demand for irrigation is a direct V outcome of rise in temperature. There is no doubt, that there would be some increases in the cost of agricultural production, lower access of food to the poorer people in the society.

Extreme rise in temperature can cause increase in vector-borne diseases extreme increase in cold-related illnesses, such as, diarrhea and other infectious diseases. Food shortages that resulted from prolonged or emergence of drought could lead to hunger, malnutrition and impairment of children's growth and development. Increased salinity intrusion could increase hunger and consequently malnutrition.

Strategies to Cope With Climate Change

The greatest problem facing the people in the tropics with regards to the problems associated with climate change is the absence of scientific, technical and socio-economic information on climate change. There is also the absence of adaptive capacity in the tropics. Planting of trees will lead to the reduction of global warming, trees act as canopy and will capture large concentration of carbon dioxide. Forests are large concentration of trees, shrubs, herbs, climbers, creepers. In other words, vegetation of the environment can reverse the effects of climate change through planting of more trees.

There are many strategies or mitigation measure to cope with climate change, with particular reference to the people in tropics (low latitudes). The following are various strategies that can be applied to assist in coping with climate change. There is a need for proper dissemination of information on climate change to aid farmers in managing floods and in boosting food production in the tropics. This is because farming is climate or weather dependent. If a farmer cannot predict weather accurately, he will plant at wrong time of the year, plant wrong seed and harvest at wrong time.

The most effective and least expensive strategy to cope with climate change is to avoid floodplains entirely in constructing houses for human habitation, since there is no way to completely eliminate possible damage. Thus, human occupation in an area prone to flooding is incompatible with the idea of risk reduction. Avoiding locating people and structures in areas where high intensity hazardous occurrences are expected or limit the total exposure people to such hazards.

Construction and maintenance of water channels to increase flow capacity: All other things being equal, it seems clear that the hazard proneness of any given area may be reduced through construction of protective facilities to reduce vulnerability to hazard areas. Dams and reservoirs can be constructed to store water from rivers and release it gradually. Street gutters, culverts can be constructed to allow easy flow of floods and blocked gutters and culverts can also be cleaned to remove blockage to allow easy flow of floods to avoid damage to property and human deaths.

There should adequate warning system: This is important because of the recurring problems of hazards all over the world which is as a result of global warming. A warning system is the generation of data on which forecast can be made, the dissemination of the forecast, the preparation of a recipient population to know. There should be effective disaster warnings from either the appropriate government agencies to inhabitants of hazard prone areas. The warnings should be in advance of the hazard occurrence. The warnings should be in English and in local languages of the inhabitants, many months ahead of the hazard occurrence.

There should be floodplain mapping which would assist human beings in identifying hazard prone areas or sites. Areas' of high risks can also be identified to avoid constructing houses in such areas or zones. There should also be building prohibition in all areas of high risk. There should be loss recovery relief, community or disaster rehabilitation packages such as, providing money for rehabilitation, loans with low interest rates, food donation to disaster victims, sheltering, temporarily of victims of disasters, distribution of medicines to disaster victims.

Building or house construction laws can be enacted to control erection of houses or structures in hazard prone areas. This can be achieved through governmental jurisdiction. Efforts should be made to develop genuine warning system to protect people and property in Hazard prone1areas. In other words, there is a strong need to forecast the magnitude of hazard with sufficient margin of time for evacuation and safety and to give a recognizable warnings at different stages of the hazard period and to propagate the warning, using the mass media and other available means of communication.

Administrative Enactments

There is a need to raise awareness of all stakeholders, policy and decision makers, physical, biological, social and environmental scientists, about climate change concerns, since action on events depends on awareness.

There should be dredging of rivers and deepening or improvement of normal water courses (floodway Dikes or levees can also be constructed to deter or prevent over flooding of river banks leading to damages of properties and loss of lives.

There should be an obligation on people to reduce their greenhouses gases emissions. There is a strong need for drought friendly crops, trees, shrubs to be introduced and encouraged to be grown within the tropics for this is so, since there is no assurance that climate change would revert to its natural temperature level in near future. Today there is no scientific evidence that climate change will disappear on earth very soon. There is also a need for more dams to be constructed or more irrigation to be constructed to supply water to our farms.

There should be a strong reduction in fertilizer application in our farms since fertilizer application emits nitrous oxide (N_20), farmers can revert to non-synthetic manure as a way of boosting food production in our farms. Re-forestation or re-planting of trees as a way of protecting the environment should be encouraged by all stakeholders. Human beings should reduce the quantity of fossil fuels in use, since such fuels are used to run vehicles, generate electricity for our industries and houses. There is a need for researchers to look for a good alternative to coal, gas and oil.

Conclusion

There is no doubt that climate change has come to stay with us and it is obvious that it has brought untold hardship to human being within the tropics.

Climate change is responsible for unpredictability of weather events these days. Increase in the amount of rainfall and flooding is directly a product of climate change globally. Extreme weather condition is as a result of the change in the climate. Expansion of desert is as a result of fast expansion of drought within the tropics. Human beings have through various activities aided climate change globally. Effects or impacts of climate change are more pronounced in the tropics than any other region in the world. Climate change can be either naturally or artificially caused many strategies can be provided to help people in the tropics cope with climate change, such as, proper dissemination of information on climate change, avoiding residing in hazardous areas and advance warnings of future occurrences of hazards.

Recommendation

Based on the findings of this research, the researcher recommends that:

- Government and other concerned agencies should make efforts to avoid locating people and structures in areas where high intensity hazardous occurrences are expected or limit the total exposure people to such hazards.

- There should adequate warning system: This is important because of the recurring problems of hazards all over the world which is as a result of global warming.
- There should be floodplain mapping which would assist human beings in identifying hazard prone areas or sites.

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