Climate Change and Its Impact on Human Disease

Dr. Menka Sisodia
Department of Zoology
Kolhan University, Chaibasa, Jharkhand- 833201 (INDIA)

ABSTRACT

The climate crisis is an emergency in the history of humankind. the north polar ice cap is melting and so are all mountain glaciers. the massive mount of ice in Greenland and the entire Antarctica is getting destabilized. the may result in the increase in the sea level by as mush as by 20ft. the stable configuration of ocean and wind currents are enfangered. almost 60 billion tons of CO2 is being emitted every year into atmosphere which is leading to the 'Greenhouse Effect' the results in 'Global Warming'.

The global warming along with the cutting and burning of forests and other critical habitats is causing the loss of living species to a level comparable the extinction the extinction that wiped out dinosaurs 65 million years ago. the most harmful effects of the climate change are-

a) The levels of CO2 in the atmosphere are rising both in the air as well as the seas.

b) The extinction of large number of land species and marine life.

c) The rise of sea levels.

d) Rise in the incidence of natural disasters like hussicanes, typhoons and tornadoes.

e) The age old rhythm of the earth seasons-summer, fall, winter and spring is also changing.

In order to mitigate the harmful effects of climate change it is important to take some steps immediately. There should be a fundamental change in our lifestyles and the way we live. This is not impossible and requires a coordinated effort by nations, communities, scientists

and ordinary human beings. This is certainly not an easy task to do but the only way to every a major crisis

1. INTRODUCTION

Climate change is a long-term shift in the climate of a specific location, region or planet. The shift is measured by changes in features associated with average weather, such as temperature, wind patterns and precipitation. The variability of climate is also considered climate change, even if average weather conditions remain the same, Climate change occurs when the climate of a specific area or planet is altered between two different period of time. Such changes can involve both changes in average weather conditions and changes in how much the weather varies around these averages. The changes can be caused by natural processes like volcanic eruptions, variations in the sun's intensity, or very slow changes in ocean circulation or land surfaces which occur on time scales of decades, centuries or longer.

Humans also cause climates to change by releasing greenhouse gases and aerosols into the atmosphere, by changing land surfaces, and by depleting the stratospheric ozone layer. Both natural and human factors that an cause climate change are called 'climate forcings', since they push, or 'force' the climate to shift to new values. Climate change refers to general shifts in climate, including temperature, precipitation, winds, and other factors.

2. MATERIALS & METHODS

2.1. Global Warming

Global warming (as well as global cooling) refers specifically to any change in the global abverage surface temperasture. Global warming is often misunferstood to imply that the world will warm uniformly. In face, an increase in average global temperature will also cause the circulation of the atmosphere to change, rewsulting in some areas of the world warming more, others less.

Some areas can even cool. Although the term Global warming significantly misrepresents what really happens, the term it is still often used by media and others to describe climate change.

2.2. Green House Effect:

A natural system known as the "green house effect" regulates temperature on Earth. Our atmosphere traps the sun's heat near earth's surface, primarily through heat trapping properties of certain ' green house gases".

Earth is heated by sunlight. Most of the Sun's energy passes through the atmosphere, to warm the earth's surface, oceans and atmosphere. However, in order to keep the atmosphere's energy budget in balance, the warmed earth also emits heat energy back to space as infrared radiation.

As this energy radiates upward, most is absorbed by clouds and molecules of Green house gases in the lower atmosphere. These re-raduate the energy in all directions, some back towards the surface and some upward, where other molecules higher up can re-emission is repeated until, finally, the energy does escape from the atmosphere to space. However, because much of the energy has been recycled downward, surface temperatures become much warmer then if the green house gases were absent from the atmosphere. This natural process is known as the green house effect.

Without green house gases, Earth's average temperature would be- 19^0C instead of $+14^0$C, or 33^0C colder.

Over the past 10,000 years, the amount of green house gases in our atmosphere has been relatively stable. Then a few centuries ago, their concentrations began to increase due to the increasing demand for energy caused by inductrialization and rising population, and due to changing land use and human settlement paterns.

2.3. GREEN HOUSE GASES

Water vapour is the most common green house gas. But others that are very important too. Some occur naturally and some come from human activity.

2.4. Carbon Dioxide or CO_2 is the most significant greenhouse gas released by human activities, mostly through the burning of fossil fuels. It is the main contributor to climate change.

2.5. Methane is produced when vegetation is burned, digested or rotted with microbes in the absence of oxygen. Garbage dumps, rice paddies, and grazing cows and other livestock release lots of methane

2.6. Nitrous oxide can be found naturally in the environment but human activities are increasing the amounts. Nitrous oxide is released when chemical fertilizers and manure are used in agriculture.

2.7. Halocarbons are a family of chemicals that include CFC_S (which also damage the ozon layer), and other human-made chemicals that contain chlorine and fluorine.

Most greenhouse gases are extremely effective at absorbing heat es ascaping from the earth and keeping it trapped. In other words, it takes only small amounts of these gases to significantly change the properties of the atmosphere. 99% of the dry atmosphere consists of nitrogen and oxygen, which are relatively transparent to sunlight and infrared energy, and have tittle effect on the flow of sunlight and heat energy through the air. By comparison, the atmospheric greenhouse gases that couse the earth's natural greenhouse use effect to total less than 1% of the atmosphere. But that tiny amount increases the earth's average surface temperature from-19^0C+14^0 C-a difference of about 33^0C. A little bit of greenhouse gas goes a long way.

Becouse the concentration of greenhouse gases in the atmosphere is so low, human emissions can have a significant effect. For example, human emission of carbon dioxide (CO_2) currently amount to roughly 28 billion tonnes per year. Over the next century human emissions will increase the concentration of dioxide in the atmosphere from about 0.03% today to almost certainly 0.06% (a doubling), and possibly to 0.09% (a tripling).

3. DISCUSSION

3.1. CLIMATE CHANGE OVER CENTURIES-

Earth's climate change naturally. Changes in the intensity of sunlight reaching the earth couse cycles of warming and cooling that have been a regular feature of the Earth's climate include variations in ocean currents(which can alter the distribution of heat and precipitation) and large eruptions of volcanoes (which can sporadically increase the concentration of atmospheric particles, blocking aot more sunlight). Still for thousand of years, the Earth's atmosphere has changed very little. Temperature and the balance of heat-trapping greenhouse gases have remained just right for humans, animals and plants to survive. But today the problem is to maintain this delicate balance. Indiscriminate use of fossil fuels to heat home, to run cars, produce electricity, and manufacture all sorts of products, resulting in the addition of more greenhouse gases to the atmosphere. It's the human-induced enhamced greenhouse effect that couses environmental concern, because it has the potential to warm the planet at a rate that has never been experienced in human history.

3.2. EFFECT OF CLIMATE CHANGE ON HUMAN BEINGS-

Climate change could also affect health and well-being. Many larger cities could experience a significant rise in the number of very hot days. Air pollution problems wouls increase, placing children, the elderly and people suffering fromn respiratory problems at

greatest risk of health effects. Increase in molds and pllens due to warmer temperatures could also couse respiratory problems such as asthma for some people.

3.3. IMPACT OF CLIMATE CHANGE ON COMMUNICABLE DISEASES-

There are concerns that some of the effects of climate change will increase the global burden of disease. High temperatures are expected to increase the occurance of heat related illness such as exhaustion, heat stroke and exacerbate existing conditions related to circulatory system and nervous system problems. Droughts can lead to malnutrition and starvation. This will compromise hygiene and health, and lead to the increased incidence of illnesses such as trachoma (an eye infection that can cause blindness) and diarrhoea, Higher rainfall in other areas and rising sea levels may lead to flooding which increases the risk of water borne diseases such as cholera. The bacterium which causes cholera thrives in warmer water. Scientists began observing Vibrio concentrations in our oceans in the 1960s. They discovered that towards the end of the 1980s, when ocean temperatures behan to rise, so too did bacteria. Plague outbreak in Surat in 1994 where strong monsoon following an immense heat wave, led to intense animal and human interface. Rising temperatures on land also result in increase in the drug resistant bacteria in the human populations.

3.4. Climate Change & Vector Borne Diseases

Climate change affects the spread of vector borne diseases both directly and indirectly. Directly, global warming and increased rainfall contribute to the abundance and distribution of vectors such as mosquitoes and ticks although mosquitoes are the most common. Rainfall leads to stagnant water pools in which mosquitoes breed. Global warming leads to increrased global teemperatures allowing mosquitoes tosurvive winters where they would otherwise have perished. Subsequently, more mosquitoes are alive to breed and transmit disease during the summer season. In addition, mosquito larvae develop much faster at higher temperatures

and after ingestion of the microorganisms become moe infectious at higher temperatures. Indirectly, other factors such as deforestation and natural disasters, decreased hygiene and stagnant water beds, increase the proliferation and survival of vectors and hence the incidence of vector-bornediseases. An important factor to sonsider is increase in travel worldwide particularly to and from vector borne disease-endemic areas. This will also increase the incidence of infection by vector borne diseases and their transmission to first world countries which harbour mostly immune populations. Climate change has been blamed for malaria in the high lands of Kenya. It is now commonly seen in the populations that have not been previously exposed. Mathematical models which liik at the relationship between climate variables and bio logical parameters such as biting rates for disease have shown that a 2-3^{0}C temperature would increase the number of prople affected by malaria by approximately 3-5% which equates to several hundred million in the world. Dengue fever has been dubbed the most important vviral vertor-borne disease in the world. It is largely a disease of the cities but is more of a problem in poorer, highly populated parts of cities with lower levels of hygiene and inadequate waste disposal.5 It is transmitted predominantly by one species of mosquito, the Aedes aegypti which prefers humans to other animals to feed on.

Bhutan and Nepal have reported Dengue for the first time. Aedes Egypti, is normally found 500m above the seal level. But now they are sighted above 2200m in Darjeeling and 4000m in Nepal. In 2011 in Jamshedpur city nearly 30,000 people have been diagnosed with this fever.

There is currently no vaccine or even pharmaceutical treatment for dengue fever so disease control is based mostly on prevention through eradication of the vector.

Chikungunya is also a viral disease caused by Aedes Egypti and Albopictus, found mostly in coasral and rural areas. In the recent time the North Easten regions on India experienced the epidemic outbreak of this disease that resulted in thousands of cases of

abortions and still births. It is imperative that climate change be reversed if future generation hope to enjoy the benefits of our earth. At the same time humans must be prepared for possible epidemics of vector-borne disease need to be alert to signs of these diseases and to notify the appropriate authorities. Adequate public health measures need to be in place to deal with disasters whether they are an epidemic or a situation that could lead to an epidemic such as a flood or landslide.

Developed nations are not exempt from the effects of climate change. Malaria has been reported in Europe and tickc encephalitis has increased as far north as Sweden in response to warmer winters. Europe has experienced heat related to climate change and even the US has endured the devastating Hurricane Katrina, also a result of climate change. Although humans must strive to half climate change, one must also be realistic and be prepared for its most likely consequences.

4. RESULT

4.1. STEP TO PREVENT THE DISEASES-

"Climate Scientists" and "Microbiologists" usually work in isolation from each other and yet their work is intimately connected. New DNA sequencing technologies spurred by Human Genome project have made it technically and economically possible to sequence the collective DNA from the microbial communities. This approach is called 'Metagenomics'. Experts in diverse discriplines in microbiogy as well as computational and climate modeling should integrate microbial biology, biochemistry and climate modeling. There are no vaccines and no treatment for most of the vector-borne disease apart from malaria, so public health measures and prevention are the best approach to tacking the problem. The best mode of prevention is reduction in greenhouse gas emissions so that climate change is halted. In the meantime, new systems to predict favourable conditions for vector proliferation, disaster

management and increased awareness about vector borne disease will hopefully prevent a widespread epidemic from occurring.

A well coordinated multicentric studies based on sound method ology can help delineate and characterize more precisely the nature and extent of climate change induced adverse health impact. Planning a communication compaign addresses at communities and indivisual on health impact of climate change and what one can do to reduce gas emission. Indivisual measures include buying energy efficient appliances, fuel efficient and environment friendly cars, regular cleaning of air filters of air conditions, using plant based paints, cleaners and pest repellents. Segregate the wastes by not allowing garbage heaps to produce Methane gas.

"There is clear evidence that microbes can have an enormous on climate. In light of the increasingly urgent need to undertand and find ways to mitigate climate change, the centrality of microbes in global biogeochemical cycles, can no longer be ignored," says Delong.

ACKNOWLEDGEMENT

The author is thankful to Dr. KanakLata, Ex-Principal, The Graduate School College for Women, Jamshedpur, and Dr. Rabinder Kumar Singh Dean Science Faculty, Kolhan University, Chaibasa for their help and encouragement during the research work completion. I am also thankful to my family members especially to my daughter Arusha and on Achyut for maintaining and cooperating throughout the completion and compilation of work and I am also thankful to Gouranga to help me throughout during the compilation of this work.

REFERENCES:

1. Githeko AK, Lindsay SW, Confalonien UE, etal. Climate change and vector-borne diseases: a regional analysis. Bull World Health Organ 2000;78:1136-1147.

2. Hales S, de Wet N, Maindonald J, et al. Potential effect of population and climate changes on global distribution of dengue fever: an emprical model. Lancet 2002;360:830-834.

3. McMichael AJ, Woodruff RE. Climate change and human health: what do we know? Med J Aust 2002;177:590-591.

4. McMichael AJ, Woodruff RE, Hales S. Climate change and human health: present and future risks. Lancet 2006;367:859-869.

5. M. van Lieshout RSK, M.T.J. Livermore, P. Martens. Climate change and malaria :analysis of the SRES climate and socio-economic scenarios. Golbal Environmental Change 2004; 14:87-99.

6. Patz JA, Martens WJ, Focks DA, et al. Dengue fever epidemic potential as projected by general circulation models of global climate change. Environ Health Perspect 1998;106:147-153.

7. Sutherst RW. Global change and human vulnerability to vector-borne disease. Clin icrobiol Rev 2004;17:136-173.

8. WHO. Malaria early warning systems, concepts, indicators and parthers: a framework for field research in Africa. In: Rolla Back Malaria/Technical Support Network for Prevention and control of malaria. Geneva: World Health Organization; 2001.

9. WHO. WHO report on global surveillance of epidemic-prone infectious diseases. In. Geneva: WHO; 2000.

10. Woodruff RE, McMichael AJ, Hales S. Action on climate change: no time to dalay. Global warming is real, so what are we going to do about it, who will do it, and when? Med J Aust 2006;184:539-540.

.