CLIMATE CHANGE AND GLOBAL WARMING: IMPLICATIONS ON EARTHS INHABITANTS

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ABSTRACT

This paper attempts to look at the changing climate and its implications on the planet earth and its inhabitants. The climate is changing and the earth is warming up. The overwhelming scientific consensus is that the climate change and its products are human induced. With global warming on the increase and species and their inhabitants on the decrease while the chances for ecosystem to adapt naturally are diminishing. This is one of the greatest threats facing the planet. This paper x-rayed the various human activities; that is bringing about the climate change as well as its implication on the lives, health and wellbeing of the earth's inhabitants. The concluding part of the review calls for the need to protect the inhabitants of the earth from the worst impact of climate change and global warming.

Keywords: Climate, Global Warming, Health, Inhabitants, Ecosystem, Earth.

INTRODUCTION

The climate is changing, the earth is warming up, and there is now overwhelming scientific consensus that it is happening, and that it is human-induced. With global warming on the increase and species and their habitats on the decrease, chances for ecosystems to adapt naturally are diminishing. Thus, climate includes patterns of temperature, precipitation, humidity, wind and seasons. "Climate change" affects more than just a change in the weather; it refers to seasonal changes over a long period of time. These climate patterns play a fundamental role in shaping natural; ecosystems, and the human economies and cultures that depend on them. Because so many systems are tied to climate, a change in climate can affect many related aspects of where and how people, plants and animals live such as food production, availability and use of water, and health risks. For example, a change in the usual timing of rains or temperatures can affect when plants bloom and set fruit, when insects hatch or when streams are their fullest. This can affect historically synchronized pollination of crops, food for migrating birds, spawning of fish, water supplies for drinking and irrigation, forest health, and more.

Some short-term climate variation is normal, but longer-term trends now indicate a change in climate. A year or two of an extreme change in temperature or other condition doesn't mean a climate change trend has been "erased." Worldwide, people are paying serious attention to climate change. Climate change is already disrupting our environment, economy and communities. We can help slow it down by taking action now.

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Many have agreed that climate change may be one of the greatest threats facing the planet. Recent years show increasing temperatures in various regions, and/or increasing extremities in weather patterns. Research has shown that air pollutants from fossil fuel use make clouds reflect more of the sun's rays back into space. This leads to an effect known as global dimming whereby less heat and: energy reaches the earth. At first, it sounds like an ironic savior to climate change problems. However, it is believed that global dimming caused the droughts in Ethiopia in the, 1970s and 80s where millions died, because the northern, hemisphere oceans were not warms enough to allow rain formation. Global dimming is also hiding the: true power of global warming. By cleaning up global dimming-causing pollutants without tackling greenhouse gas emissions, rapid warming has been observed, and various human health and ecological disasters have resulted, as witnessed during the European heat wave in 2003, which saw thousands of people die.

CLIMATE CHANGE

Climate change is used to describe a change in the climate, measured in terms of its statistical properties, e.g., the global mean surface temperature. Climate is taken to mean the average weather. Climate can change over period of time ranging from months to thousands or millions of years. The classical time period is 30 years, as defined by the World Meteorological Organization. The climate change referred to may be due to natural causes, e.g., changes in the sun's output, or due to human activities, e.g., changing the composition of the atmosphere. Any human-induced changes in climate will occur against the "background" of natural climatic variations.
Global warming refers to the change in the Earth's global average surface temperature. Measurements show a global temperature increase of 1.4 ^{0}F (0.78 ^{0}C) between the years 1900 and 2005. Global warming is closely associated with a broad spectrum of other climate changes, such as increases in the frequency of intense rainfall, decreases in snow cover and sea ice, more frequent and intense heat waves, rising sea levels,, and widespread ocean acidification.

GLOBAL WARMING

Global warming also refers to the rising average temperature of Earth's atmosphere and oceans and its projected continuation. In the last 100 years, Earth's average surface temperature increased by about 0.8 ^{0}C (1.4 ^{0}F) with about two thirds of the increase occurring over just the last three decades. Warming of the climate system is unequivocal, and scientists are more than 90% certain most of it is caused by increasing concentrations of greenhouse gases produced by human activities such as deforestation and burning fossil fuel. The effect of human activities on the climate can be measured by radioactive forcing: Energy is constantly flowing into the atmosphere in the form of sunlight that always shines on half of the Earth’s surface. Some of this sunlight is reflected back to space and the rest is absorbed by the planet. Some energy from the Earth is also radiated back out into space as invisible infrared light. Radioactive forcing is a measure of the energy flowing into the Earth atmosphere system, minus the energy flowing out. A positive radioactive forcing will tend to warm the climate, while a negative forcing will tend to cool the climate. Atmospheric forcing (i.e, the radioactive forcing due to human activities) was estimated to have been positive (i.e, an overall warming effect) in the year 2005. This is relative to the estimated forcing at the start of the industrial era, taken as the year

1750. Anthropogenic forcing of the climate has likely to contributed to a number of observed changes, including sea levels rise, changes in climate extremes (such as warm and cold days), declines in Artic sea ice extent, and to glacier retreat.

Observations show that there have been changes in weather. As climate changes, the probabilities of certain types of weather events are affected. Changes have been observed in the amount, intensity, frequency, and type of precipitation. Widespread increases in heavy precipitation have occurred, even in places where total rain amounts have decreased. Authors of the IPCC (International Panel On Climate Change) Assessment Report concluded that human influences had, more likely than not (greater than 50% probability, based on expert judgment), led to an increase in the frequency of heavy precipitation events. Projections of future changes in precipitation show overall increases in the global average, but with substantial shifts in where and how precipitation falls. Climate models tend to project increasing precipitation at high latitudes and in the tropics (e.g., the south-east monsoon region and over the tropical Pacific) and decreasing precipitation in the sub-tropics (e.g., over much of North Africa and the northern Sahara).

Evidence suggests that, since the 1970s, there have been substantial increases in the intensity and duration of tropical storms and hurricanes. Models project a general tendency for more intense but fewer storms outside the tropics.
Since the late 20th century, changes have been observed in. the trends of some extreme weather and climate events, e.g., heat waves. Human activities have, with varying degrees of confidence, contributed to some of these observed trends.

Projections for the 21st century suggest continuing changes in trends for some extreme events. Solomon *et al*., (2007), for example, projected the following likely (greater than 66% probability, based on expert judgment) changes:

- An increase in the areas affected by drought;
- Increased tropical cyclone activity;
- And increased incidence of extreme high sea level (excluding tsunamis).
- Projected changes in extreme events will have predominantly adverse impacts on ecosystems and human society.

An increase in global temperature will cause sea levels to rise and will change the amount and pattern of precipitation, and a probable expansion of subtropical deserts. Warming is expected to be strongest in the Arctic and would be associated with continuing retreat of glaciers, permafrost and sea ice. Other likely effects of the warming include more frequent occurrence of extreme weather events including heat waves, droughts and heavy rainfall events, species extinctions due to shifting temperature regimes, and changes in crop yields. Warming and related changes will vary from region to region around the globe, with projections being more robust in some areas than others. In a 4 ^{0}C world/ the limits for human adaptation are likely to be exceeded in many parts of the world, while the limits for adaptation for natural systems would

largely be exceeded throughout the world. Hence, the ecosystem services upon which human livelihoods depend would not be preserved.

The role of the oceans in global warming is also a complex one. The oceans serve as a sink for carbon (iv) oxide (CO_2), taking up much that would otherwise remain in the atmosphere, but increased levels of CO_2 have led to ocean acidification. Furthermore, as the temperature of the oceans increases, they become less able to absorb excess CO_2. The ocean has also acted as a sink in absorbing extra heat from the atmosphere. This extra heat has been added to the climate system due to the build-up of (Green house gases) GHGs. More than 90 percent of warming that occurred over 1960-2009 is estimated to have gone into the oceans.

Global warming is projected to have a number of effects on the oceans. Ongoing effects include rising sea levels due to thermal expansion and melting of glaciers and ice sheets, and warming of the ocean surface, leading to increased temperature stratification. Other possible effects include large-scale changes in ocean circulation. About one-third of the carbon (iv) oxide emitted by human activity has already been taken up by the oceans. As carbon (iv) oxide dissolves in sea water, carbonic acid is formed, which has the effect of acidifying the ocean, measured as a change in pH. The uptake of human carbon emissions since the year 1750 has led to an average decrease in pH of 0.1 units. Projections using the SRES emissions scenarios suggest a further reduction in average global surface ocean pH of between 0.14 and 0.35 units over the 21st century.

The effects of ocean acidification on the marine biosphere have yet to be documented. Laboratory experiments suggest beneficial effects for a few species/ with potentially highly detrimental effects for a substantial number of species. With medium confidence, Fischlin *et al*., (2007) projected that future ocean acidification and climate change would impair a wide range of planktonic and shallow benthic marine organisms that use aragonite to make their shells or skeletons/ such as corals and marine snails (pteropods), with significant impacts particularly in the Southern Ocean.

The amount of oxygen dissolved in the oceans may decline/ with adverse consequences for ocean life. The graph below shows the global annual temperature change since 1880. Even with variation over the years/ the general trend is clearly upward. Some cooler temperatures in recent years have prompted people to ask if there is now a global cooling trend, but as the graph shows, even several years of cooling don't mean a long-term warming trend is over.

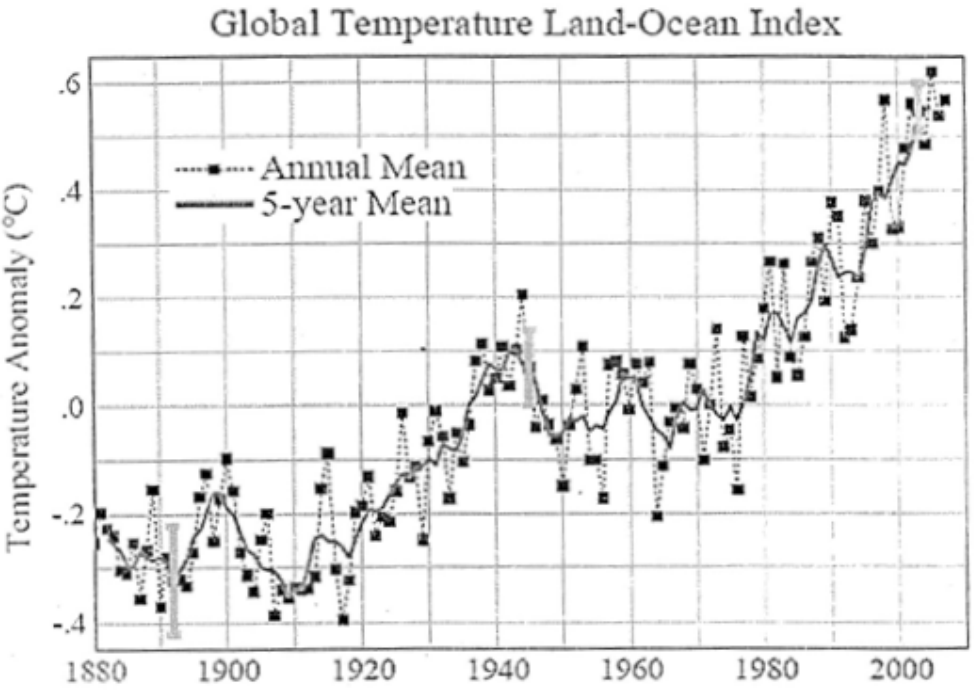

Fig 1:

The land-ocean temperature index combines data on air temperatures over land with data on sea surface temperatures. ("Mean" is the midpoint between the highest and lowest.) The black line shows the annual changes; the dotted line tracks 5-year periods. Source: NASA Goddard institute for Space Studies. (January 11, 2008). Although specific, individual events can't be directly linked to global warming, the IPCC has noted many indications of climate change around the world:

- Retreating mountain glaciers on all continents
- Thinning ice caps in the Arctic and Antarctic
- Rising sea level -- about 6-7 inches in the 20th century
- More frequent heavy precipitation events (rainstorms, floods or snowstorms) in many areas.
- More intense and longer droughts over wider areas, especially in the tropics and sub tropics.

Moreover, Science has shown that global warming will affect human health across the world. From diminished air quality and degradation of food and water supplies to increasing levels of allergens and catastrophic weather events, we will experience a number of worsening health threats during our lifetimes. Fortunately, urgent action can help us avoid the worst of these impacts. First, the entire world must address global warming through mandatory legislation that reduces global warming pollution on the order of 80 percent by 2050.

In addition, the national and -local public health system must protect communities by preparing for eight of the underlisted most pressing health hazards associated with climate change.

EFFECT OF GLOBAL WARMING

Extreme Storms Will Affect Health and Infrastructure: Science tells us that global warming has contributed to more hurricanes and intense storms in the North Atlantic, Asia and Africa during the last several decades. Increased storm wind speeds and more intense rainfall are projected as the climate warms. More severe storms and floods can lead to drowning, injuries, and outbreaks of infectious disease. Storms also damage basic infrastructure with moisture leading to mold growth that can exacerbate allergies and respiratory illnesses.

1. **Heat Waves Will Lead to Increased Death and Illness:** The frequency and duration of heat waves in the United States is projected to increase substantially because of global warming. As temperatures increase, so do the number of deaths and illnesses occurring from heat exhaustion or heatstroke, cardiovascular disease, and kidney disease. Extreme heat waves cause the most harm among elderly and young children. Urban and City dwellers are at particular risk because of elevated temperatures in cities, known as the "urban heat island effect."

2. **Air Pollution Will Contribute to More Smog and Respiratory Illness**: Rising temperatures will increase ozone smog in many areas, especially in cities. Increasing levels of ground-level ozone are associated with increased hospital admissions for people with respiratory diseases such as asthma and will worsen the health of people suffering from cardiac or pulmonary disease.

3. **Pollen Allergens Will Proliferate**: Higher temperatures and increased levels of carbon (iv) oxide may cause allergenic pollen season to start earlier, last longer, and be more intense. For example, higher levels of carbon (iv) oxide can cause ragweed to produce 60 percent more pollen than normal. With increases in airborne pollen, those who suffer from seasonal allergies are likely to experience worse symptoms, including hayfever and asthma.

4. **Mosquito- and Tick-Borne Infectious Diseases Will Spread More Widely:** Climate change will affect the patterns of diseases such as malaria, West Nile virus, dengue fever and Lyme disease. Warming temperatures and increasing amounts of rainfall have been associated with increases in the occurrence and transmission of insect-borne diseases, and higher temperatures lead to more rapid development dangerous pathogens within insect carriers. Warming temperatures allow these diseases to expand their range into new, once cooler, regions.

5. **Drinking Water Will Become Increasingly Contaminated:** Outbreaks of water-borne diarrheal diseases caused by parasites, like *Giardia* and

Cryptosporidium, have been associated with heavy rainfall events, which are likely to become more frequent due to global warming. For example, recent cholera outbreaks in Bangladesh and some parts of Africa have been brought on by heavy rains. The impact of global warming on the safety of water supplies will be most severe in developing countries of the world, where water treatment is less available.

6. **Water and Food Supplies Will Be Threatened:** Global warming is expected to worsen floods and droughts, threatening the availability of water for drinking and irrigation. Droughts diminish food variety, nutritional content, and availability all of which can contribute to malnutrition, infectious diseases, and starvation. Warming ocean temperatures bring shifts in the geographic range of fish populations and can severely impact local food supplies. One analysis predicts that by the year 2060, there, will be an additional 40 to 300 million people at risk of malnutrition from human-caused climate change, and global warming's higher temperatures can increase the risk of food-borne illnesses.

7. **There Will Be Large Numbers of Environmental Refugees:** Sea-level rise will leave some areas uninhabitable, forcing people to flee their homes in coastal regions. The 'United Nations estimates that in the next 10 years there will be up to 50 million "environmental refugees"—people forced to migrate from their homes by a range of climate change-related environmental disasters like floods, droughts, and desertification. Health among these refugees will be threatened by associated increases in urban, crowding, lack of water, and transmission of infectious diseases.

   A paper by researchers from the University of Oxford and the University of Florida published in Nature in May 2010 concluded that claims that a warming climate has led to more widespread disease and death due to malaria are largely at odds with the evidence, and that "predictions of an intensification of malaria in a warmer world, based on extrapolated empirical relationships or biological mechanisms, must be set against a context of a century of warming that has seen, marked global declines in the disease and a substantial weakening of the global correlation between malaria endemicity, and climate.

8. **Infectious Diseases:** There is good evidence that diseases transmitted by rodents sometimes increase during heavy rainfall and flooding because of altered patterns of human-pathogen-rodent contact.

Projections: With very high confidence, Confalonieri *et al.,* (2007) concluded that climate change would have mixed effects on malaria. Malaria is a complex disease to model and all of the published models assessed by Gonfalonieri *et al.,* (2007) had limited parametrization of some key factors. Parametrization is used in climate models because the resolution of models of models is insufficient to resolve some physical processes. Given this limitation, models assessed by Confalonieri *et al.,* (2007) projected that, particularly in Africa, climate change would be associated with geographical expansions of the areas suitable for *Plasmodium falciparum* malaria in some regions, and contractions in other-

regions. Projections also suggested that some regions would experience a longer season of transmission. Projections suggested expansions in vector species that carry dengue for parts of Australia, Africa and New Zealand.

Ground – Level Ozone: Confalonieri *et al.,* (2007) also projected that climate change would increase cardio-respiratory morbidity and mortality associated with ground-level ozone. Ground-level ozone is both naturally occurring and is the primary constituent of urban; smog. Ozone in smog is 'formed through chemical reactions involving nitrogen oxides and other compounds. The reaction is a photochemical reaction, meaning that it involves electromagnetic radiation, and occurs in the presence of bright sunshine and high temperatures. Exposure to elevated concentrations of ozone is associated with increased hospital admissions for pneumonia, chronic obstructive pulmonary disease, asthma, allergic rhinitis and other respiratory diseases, and with premature mortality.

Background levels of ground-level ozone have risen since pre-industrial times because of increasing emissions of methane, carbon monoxide (Carbon ii oxides) and nitrogen oxides. This trend is expected to continue into the mid-21st century.

PROTECTING OURSELVES FROM THE WORST IMPACTS OF GLOBAL WARMING

The range of potential threats to health and life posed by global warming has never been clearer. Therefore to protect ourselves from the worst impacts of global warming our governments at various levels, relevant agencies and policy makers are to act immediately to reduce global warming emissions at least by 80 percent by 2050 in order to avoid the worst potential impacts of a changing climate. We must also prepare the public health system to respond .to the range of anticipated health threats that will accompany global warming.

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