How humans have contributed to climate change

Environment, Climate Change

CLIMATE CHANGE: HOW THE HOMO SAPIENS HAVE CONTRIBUTED By Ernest Ebo Jackson TERM PAPER Climate change refers to change in average weather patterns and can be caused by both natural processes and human activities. In the past, the earth's climate has been affected by natural factors such as changes in solar output and the discharge of volcanic ash. In fact, the planet has been through many periods of cooling and warming. The last period of major cooling ended about 10, 000 years ago. The physical evidence that suggests that the earth’s climate is changing is truly overwhelming.

The world’s glaciers are retreating and disappearing, extreme weather is occurring more often now than in the past, the sea’s level and temperature is on the rise and it’s becoming more acidic, increased evaporation is drying out the earth’s supply of fresh water found in lakes and rivers, heat waves kill thousands in Europe, uncontrollable forests fires are destroying forests reserves in places like Australia and Africa, and increasing atmospheric temperature is raising the budget of many families in tropical countries use in cooling their homes.

Need I say more? The sun's warmth heats the surface of the earth, which in turn radiates energy back to space. Some of this radiation, which is nearly all in the infrared spectrum, is trapped in the atmosphere by greenhouse gases. For instance, water vapor strongly absorbs radiation with wavelengths between 4 and 7 micrometers, and carbon dioxide (CO2) absorbs radiation with wavelengths between 13 and 19 micrometers. The trapped radiation warms the lower atmosphere, or troposphere.

Some heat then finds its way back down to the Earth's surface, making it hotter than it would otherwise be. This is the greenhouse effect. Carbon dioxide levels in the atmosphere over the last 400, 000 years show a rise since the industrial revolution. Analysis of ice in a core drilled from an ice sheet such as the Antarctic ice sheet enables scientist to arrive at this conclusion. But since when did humans becoming aware of the potentially adverse effects of Carbon dioxide emissions on the climate? As early as 1827, French polymath Jean-Baptiste Fourier predicts an atmospheric effect eeping the earth warmer than it would otherwise be. He is the first to use a greenhouse analogy. Also in 1957, US oceanographer Roger Revelle warns that humanity is conducting a " large-scale geophysical experiment" on the planet by releasing greenhouse gases. Colleague David Keeling sets up first continuous monitoring of CO2 levels in the atmosphere. Keeling soon finds a regular year-on-year rise. Over the years, there have been many conferences aimed at finding solutions to climate change orglobal warming.

In 1985 for instance, there was a major international conference on the greenhouse effect at Villach, Austria, which warned that greenhouse gases will " in the first half of the next century, cause a rise of global mean temperature which is greater than any in man's history. " This could cause sea levels to rise by up to one meter, researchers say. The conference also reports that gases other than carbon dioxide, such as methane, ozone, CFCs and nitrous oxide, also contribute to warming.

The world’s nations however have not been united in their quest to curb global warming or climate change. Many nations have been selfish,

especially developed ones, seeking first to achieve or maintain economic growth and thus world dominance rather than make the sacrifices needed to reverse the negative trend of climate change. . A revisit to some historical event will help buttress this point. 1995 proved to be the hottest year recorded to date. In March, the Berlin Mandate is agreed by signatories at the first full meeting of the Climate Change Convention in Berlin.

Industrialized nations agree on the need to negotiate real cuts in their emissions, to be concluded by the end of 1997. In 1996, at the second meeting of the Climate Change Convention, the US agrees for the first time to legally binding emissions targets and sides with the IPCC against influential skeptical scientists. After a four-year pause, global emissions of CO2 resume their steep climb, and scientists warn that most industrialized countries will not meet Rio agreement to stabilize emissions at 1990 levels by the year 2000.

Furthermore, in 1997, Kyoto Protocol agrees legally binding emissions cuts for industrialized nations, averaging 5. 4%, to be met by 2010. The meeting also adopts a series of flexibility measures, allowing countries to meet their targets partly by trading emissions permits, establishing carbon sinks such as forests to soak up emissions, and by investing in other countries. The precise rules are left for further negotiations. Meanwhile, the US government says it will not ratify the agreement unless it sees evidence of " meaningful participation" in reducing emissions from developing countries.

In 2001, the new US president, George W Bush, renounces the Kyoto Protocol because he believes it will damage the US economy. After some

hesitation, other nations agree to go ahead without him. Talks in Bonn in July and Marrakech in November finally conclude the fine print of the protocol. Analysts say that loopholes have pegged agreed cuts in emissions from rich-nation signatories to less than a third of the original Kyoto promise. Signatory nations urged to ratify the protocol in their national legislatures in time for it to come into force before the end of 2002.

Now let’s talk about a second human behavior that is negatively impacting the climate –deforestation. Deforestation is the permanent destruction of indigenous forests and woodlands by the processes of humans such as logging and/or burning of trees in a forested area. Deforestation occurs because of many reasons: trees or derived charcoal are used as or sold for fuel or a commodity to be used by humans, while cleared land is used by humans as pasture for livestock, plantations of commodities, and settlements.

People's removal of trees without sufficient reforestation has resulted in damage to habitat, biodiversity loss and aridity. It has adverse impacts on biosequestration (the capture and storage of the atmospheric greenhouse gas carbon dioxide by biological processes) of atmospheric carbon dioxide. Deforested regions typically incur significant adverse soil erosion and frequently degrade into wasteland. Forests (an area with a high density of trees.) are the most natural biological formation. They serve many functions. Firstly, forests protect and form other natural resources.

Thanks to the processes of photosynthesis, they renew the oxygen stock in the atmosphere by fixing atmospheric carbon dioxide and moderating the

greenhouse effect. Forests also allow for the existence of many species of plants and animals, thus protecting diversity of nature and its gene stock. Forests clean theenvironmentby muffling noises, lowering the wind strength as well as stopping dust and gases. They have a regulatory influence on surface water runoff; they moderate high and low temperatures and prevent soil erosion.

By performing all of the above listed functions forests stabilize the climate and shape the landscape. Forests create conditions for relaxation, recreation and improvement ofhealth. Only when actively growing can trees or forest remove carbon over an annual or longer timeframe. The decay and burning of wood releases much of this stored carbon back to the atmosphere. In order for forests to take up carbon, the wood must be harvested and turned into long-lived products and trees must be re-planted.

Sadly consumer trends indicate the humans like to discard products such as furniture after only a few years of usage and buy new ones, increasing the need for wood and thus deforestation. Reducing emissions from the tropical deforestation and forest degradation in developing countries has emerged as new potential solution to complement ongoing climate policies. The idea consists in providing financial compensations for the reduction of greenhouse gas (GHG) emissions from deforestation and forest degradation". The earlier these ideas are implemented, the better for us.

The hydrological effects on climate as a result of deforestation are even more alarming. The water cycle is probably the most affected by deforestation. Trees extract groundwater through their roots and release it

into the atmosphere. When part of a forest is removed, the trees no longer evaporate away this water, resulting in a much drier climate. Already, acute water shortages in countries like Egypt, Israel, Jordan, Palestine and Iraq has resulted in armed conflicts with factions fighting to control the scanty water resources available.

Water prices increase too is an indication of global water shortage. In Britain, water and sewage bills increased 67 percent between 1989 and 1995. The rate at which people's services were disconnected rose by 177 percent. Deforestation also contributes to decreased evapotranspiration (the sum of evaporation and plant transpiration from the Earth's land surface to atmosphere), which lessens atmospheric moisture which in some cases affects precipitation levels downwind from the deforested area, as water is not recycled to downwind forests, but is lost in runoff and returns directly to the oceans.

According to one preliminary study in deforested north and northwest China, the average annual precipitation decreased by one third between the 1950s and the 1980s. Trees, and plants in general, affect the water cycle significantly: their canopies intercept a proportion of precipitation, which is then evaporated back to the atmosphere (canopy interception); their litter, stems and trunks slow down surface runoff; their roots create macropores - large conduits - in the soil that increase infiltration of ater; they contribute to terrestrial evaporation and reduce soil moisture via transpiration; their litter and other organic residue change soil properties that affect the capacity of soil to store water. Their leaves control the humidity of the atmosphere by

transpiration. 99% of the water pulled up by the roots move up to the leaves for transpiration. As a result, the presence or absence of trees can change the quantity of water on the surface, in the soil or groundwater, or in the atmosphere. This in turn changes erosion rates and the availability of water for either ecosystem functions or human services.

Tropical rainforests produce about 30% of our planet's fresh water. So what are we waiting for? When will human start acting to reverse these trends? I wish I knew. The third human activity that has contributed to global warming is the use of chlorofluorocarbon. A chlorofluorocarbon (CFC) is an organic compound that contains carbon, chlorine, and fluorine. Many CFCs have been widely used as refrigerants, propellants (in aerosol applications), and solvents. Applications exploit the low toxicity, low reactivity, and low flammability of the CFCs.

During World War II, various chloroalkanes were in standard use in military aircraft. After the war they slowly became more common in civil aviation as well. In the 1960s, fluoroalkanes and bromofluoroalkanes became available and were quickly recognized as being highly effective fire-fighting materials. By the late 1960s they were standard in many applications where water and dry-powder extinguishers posed a threat of damage to the protected property, including computer rooms, telecommunications switches, laboratories, museums and art collections.

Beginning with warships, in the 1970s, bromofluoroalkanes also progressively came to be associated with rapid knockdown of severe fires in confined spaces with minimal risk to personnel. By the early 1980s,

bromofluoroalkanes were in common use on aircraft, ships, and large vehicles as well as in computer facilities and galleries. A planet's climate is decided by its mass, its distance from the sun and the composition of its atmosphere. Earth's atmosphere is 78% nitrogen, 21% oxygen, and 1% other gases. Carbon dioxide makes up just 0. 03 - 0. 04% with water vapour varying in amount from 0 to 2%.

Without the greenhouse gases, Earth's average temperature would be roughly -20°C. The use of chlorofluorocarbons (CFCs) in machinery and other purposes have resulted in the release of CFCs into the atmosphere which intensifies the heat-trapping properties of the atmosphere as a whole. There is no natural process that release CFCs. In addition, CFCs rise into the upper layer of the atmosphere, the stratosphere, where they destroy the protective layer of ozone, a gas that forms a shield against ultraviolet rays that can harm many forms of life.

About l million tons (over 900, 000 metric tons) per year of CFCs have been released worldwide since the mid l970s. Demand for refrigeration (which has cooling systems that use CFCs) in developing countries is projected to increase greatly, especially in China and India. Ozone losses in the upper atmosphere are occurring at all latitudes in both hemispheres. The most striking example of ozone loss occurs over the South Pole during September and October. As ozone is lost, the amount of biologically harmful UV-B radiation will increase.

Skin cancer rates are expected to increase. Other health effects will likely include an increase in cataracts and suppression of the immune system.

Increased UV-B radiation may also harm plants and animals. These CFCs have a global warming potential of up to 11, 000 times as strong as carbon dioxide by weight. Unfortunately, millions of products such as refrigerators, air conditioners, fire extinguishers and aerosol cans that contain CFCs are still in use around the world and are nearing the end of their usable lives.

The next 10-20 years present a unique one-time opportunity to prevent emissions from these products as they are retired and therefore mitigate ozone damage and global climate change. The damage caused by CFCs was discovered by Sherry Rowland and Mario Molina who, after hearing a lecture on the subject of James Lovelock's work, embarked on research resulting in the first publication suggesting the connection in 1974. It turns out that one of CFCs' most attractive features—their low reactivity— is the key to their most destructive effects.

CFCs' lack of reactivity gives them a lifep that can exceed 100 years, giving them time to diffuse into the upper stratosphere. Once in the stratosphere, the sun's ultraviolet radiation is strong enough to cause the homolytic cleavage of the C-Cl bond. Since the late 1970s, the use of CFCs has been heavily regulated. By 1987, in response to a dramatic seasonal depletion of the ozone layer over Antarctica, diplomats in Montreal forged a treaty, the Montreal Protocol, which called for drastic reductions in the production of CFCs.

On March 2, 1989, 12 European Community nations agreed to ban the production of all CFCs by the end of the century. In 1990, diplomats met in London and voted to significantly strengthen the Montreal Protocol by calling

for a complete elimination of CFCs by the year 2000. On October 2 2009, the Environmental and Energy Study Institute (EESI) held a briefing about the stockpile of chlorofluorocarbons (CFCs) in old equipment and building infrastructure, and the enormous potential for these potent greenhouse gases to accelerate climate change.

These CFC “ banks” store the equivalent of 18 billion tons of carbon dioxide, approximately one-third of which will be emitted over the next decade under business as usual. EESI estimates that the destruction of CFCs could cost $62 -$180 billion globally. No wonder institutions are reluctant to destroy them though they are very much conscious of the effects CFCs are having on our climate. As the evidence shows, we have ourselves to blame for the unfavorable climate in recent history.

Our practices are changing the climate and we are conscious of it but still keep on living life as if nothing is at stake. The billions of dollars that we gain from over-exploiting the earth are the same billion we spent on relief for victims of extreme weather. What then do we gain? The U. S. has sustained 96 weather-related disasters over the past 30 years in which overall damages/costs reached or exceeded $1 billion. The total normalized losses for the 96 events exceed $700 billion. Read an instance in the paragraph below.

Southwest/Great Plains Drought persists for an entire year in 2009. Drought conditions occurred during much of the year across parts of the Southwest, Great Plains, and southern Texas causing agricultural losses in numerous states (TX, OK, KS, CA, NM, and AZ). The largest agriculture losses occurred

in TX and CA. Estimate of over $5. 0 billion in damages/costs. I believethe arguments presented herein are very conclusive. Humans have contributed immensely to climate change and they are paying for it.