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Effects of Global Warming on the Environment

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ABSTRACT: Global warming is the current rise in temperature of the air and oceans. It is happening mainly because humans burn coal, oil, and natural gas; and cut down forests.[2] Average temperatures today are about 1 °C (1.8 °F) higher than before people started burning a lot of coal around 1750.[3] In some parts of the world it is less and some more. Most climate scientists say that by the year 2100 temperatures will be 2 °C (3.6 °F) to 4 °C (7.2 °F) higher than they were before 1750.[4]Global warming is a significant and rapidly accelerating issue caused by human activities, such as greenhouse gas emissions, deforestation, and the burning of fossil fuels. It is having a profound impact on the environment and our planet. The present global warming is mostly because of people burning things, like gasoline for cars and natural gas to keep houses warm. But the heat from the burning itself only makes the world a tiny bit warmer: it is the carbon dioxide from the burning which is the biggest part of the problem. Among greenhouse gases, the increase of carbon dioxide in the atmosphere is the main cause of global warming. Svante Arrhenius predicted this more than a hundred years ago. Arrhenius confirmed the work of Joseph Fourier 200 years ago.When people burn fossil fuels like coal, oil and natural gas this adds carbon dioxide into the air.[5] This is because fossil fuels contain lots of carbon and burning means joining most of the atoms in the fuel with oxygen. When people cut down many trees (deforestation), this means less carbon dioxide is taken out of the atmosphere by those plants. Animals which have four places in their stomachs, like cows and sheep, also cause global warming, because their burps contain a greenhouse gas called methane.[6]As the Earth's surface temperature becomes hotter the sea level rises. This is partly because water over 4 °C (39 °F) expands when it gets warmer.[7] It is also partly because warm temperatures make glaciers and ice caps melt. The sea level rise causes coastal areas to flood.[8] Weather patterns, including where and how much rain or snow there is, are changing. Deserts will probably get bigger. Colder areas will warm up faster than warm areas. Strong storms may become more likely and farming may not make as much food. These changes will not be the same everywhere.[9]In the Paris Agreement almost all governments agreed to keep temperature rise below 2 °C (3.6 °F), but current plans are not enough to limit global warming that much.[10] People in government and the Intergovernmental Panel on Climate Change (IPCC) are talking about global warming. But governments, companies, and other people do not agree on what to do about it. Some things that could reduce warming are to burn less fossil fuels, grow more trees, eat less meat, and put some carbon dioxide back in the ground. People could adapt to some temperature change. A few people think nothing should change.

KEYWORDS: global warming, temperature, methane, ice caps, climate change, carbon dioxide, Paris agreement

I.INTRODUCTION

Climate change has happened constantly over the history of the Earth, including the coming and going of ice ages. But modern climate change is different because people are putting carbon dioxide into the atmosphere more quickly than before.[11][12]Since the 1800s, people have recorded the daily temperature. By about 1850, there were enough places measuring temperature so that scientists could know the global average temperature. Compared with before people started burning a lot of coal for industry, the temperature has risen by about 1 °C (1.8 °F).[3] In 1979, satellites started measuring the temperature of the Earth.[13]Before 1850, there were not enough temperature measurements for us to know how warm or cold it [1] was. Climatologists measure other things to try to figure out past temperatures before there were thermometers. This means measuring things that change when it gets colder or warmer. One way is to cut into a tree and measure how far apart the growth rings are. Trees that live a long time can give us an idea of how temperature and rain changed while they were alive.For most of the past 2000 years the average temperature of the world didn't change much. There were some times where the temperatures were a little warmer or cooler in some places. One of the most famous warm times was the Medieval Warm Period and one of the most famous cool times was the Little Ice Age (not really an ice age).[2] Tree ring dating can only help scientists work out the temperature back to about 10,000 years ago.[14] Ice cores are used to find out all the temperature back to almost a million years ago,[15] and for some times to over 4 million years ago.[16] There are several greenhouse gases that cause the Earth to warm. The most important one is carbon dioxide (CO_2). CO_2 comes from power plants which burn coal and natural gas to make electricity. Cars also emit CO_2 when they burn petrol. About 35 billion tons of carbon dioxide are released into the

Earth's atmosphere each year.[17] The amount of CO_2 in the air is about 50% more than it was around 1750.[18] About three-quarters of the CO_2 that people have put in the air during the past 20 years are due to burning fossil fuel like coal or oil. The rest mostly comes from changes in how land is used, like cutting down trees.[19]The second most important greenhouse gas is methane. A tonne of methane is much more warming than a tonne of CO_2 but methane stays in the atmosphere for only about ten years.[20] About 40% comes from nature, like wetlands; and the rest is because of humans, like cows, landfill and leaks when oil and gas are produced.[21][22] Dust in the air may come from natural sources[3] such as volcanos,[23][24] erosion and meteoric dust. Some of this dust falls out within a few hours. Some is aerosol, so small that it could stay in the air for years. The aerosol particles in the atmosphere make the earth colder. The effect of dust therefore cancels out some of the effects of greenhouse gases.[25] Even though humans also put aerosols in the air when they burn coal or oil this only cancels out the greenhouse effect of the fuel burning for less than 20 years: however the carbon dioxide stays in the atmosphere much longer and keeps on warming the earth.[26]When people burn stuff the aerosols, for example smoke, are bad because when people breath them they make people ill. [4]But some people say that in a climate change emergency the Earth could be kept cool by reflecting some sunlight back into space, for example by putting aerosols very high in the air or making clouds whiter. They say this would give more time to do a proper fix.[27] This is so easy and cheap that even a middle-size country could do it.[28] But there are a lot of problems: for example it might be good for that country but bad for some other countries.[29] Some people burn less fossil fuel. Countries try to emit less greenhouse gases. The Kyoto Protocol was signed in 1997. [5]It was meant to reduce the amount of greenhouse gases in the atmosphere to below their levels in 1990. However, carbon dioxide levels have continued to rise.[6]

Energy conservation is used to burn less fossil fuel. People can also use energy sources that don't burn fossil fuel, like solar panels or electricity from nuclear power or wind power. Or they can prevent the carbon dioxide from getting out into the atmosphere, which is called carbon capture and storage (CCS).[7] People can change how they live because of the effect of climate change. For example, they can go to places where the weather is better, or build walls around cities to keep flood water out. This cost money, and rich people and rich countries will be able to change more easily than the poor. As early as the 1820s some scientists were discussing climate change: sunlight heats the surface of the Earth, and Joseph Fourier suggested that some of the heat radiated from the surface is trapped by the atmosphere before it can escape into space. This is called the greenhouse effect.[8]

In 1856 Eunice Newton Foote did tests which showed that the warming effect of the sun is greater for air with water vapour than for dry air, and that the effect is even greater with carbon dioxide. So she said that "An atmosphere of that gas would give to our earth a high temperature...".[31] Starting in 1859, John Tyndall showed that nitrogen and oxygen—together totaling 99% of dry air—are transparent to radiated heat. However, water vapour and gases such as methane and carbon dioxide absorb radiated heat and re-radiate that heat into the atmosphere. Tyndall suggested that changes in the concentration of these gases may have caused climatic changes in the past, including ice ages. In 1896, Svante Arrhenius tried to prove that it would take thousands of years for the industrial production of CO_2 to raise the Earth's temperature 5-6°C.[9]

In the mid 20th century, scientists worked out that there was a 10% increase in carbon dioxide in the atmosphere over the 19th century, [10]which made it a bit warmer. It was at this time that people believed the emissions of CO_2 would increase exponentially in the future and the oceans would absorb any surplus of greenhouse gases. In 1956, Gilbert N. Plass decided that greenhouse gas emissions would have an effect on the Earth's temperature. He argued that not thinking about GHG emissions would be a mistake. Soon after, scientists studying all different kinds of science began to work together to figure out the mystery of GHG emissions and their effects[11]. As technology advanced, it was in the 1980s that there was proof of a rise in CO_2 levels. An ice core, captured through drilling, provided clear evidence that carbon dioxide levels have risen.[32]

Sea level is rising because water over 4 °C (39 °F) expands when it gets warmer.[7] Probably more important is the melting of ice sheets. The Antarctica and Greenland ice sheets are melting. Sea level will rise between half and one meter by 2100,[12] and between 2 and 7 meter by 2300.[33]

Low-lying areas such as Bangladesh, Florida, the Netherlands and other areas face massive flooding.[34][35]

Many cities are sea ports and under threat of flooding if the present sea level rises.[13]

II.DISCUSSION

Carbon neutrality refers to the goal of getting to net-zero carbon dioxide emissions to prevent or reduce global warming. This can be done by balancing emissions of carbon dioxide with its removal (often through carbon offsetting) or by eliminating emissions from society (the transition to the "post-carbon economy").[1] It is used in the context of carbon dioxide-releasing processes associated with transportation, energy production, agriculture, and industry.[14]

Some countries are carbon neutral: Comoros, Gabon, Guyana, Madagascar, and Niue. While Bhutan, Panama, and Suriname are carbon-negative countries.[2]

Climate change is the climate of Earth changing. The Earth's climate has been much hotter and colder than it is today.[1] Climate change this century and last century is sometimes called global warming, because the average temperature on the surface has risen.[1] The last decade (2011-2020) was the warmest on record[15], and each of the last four decades has been warmer than any previous decade since 1850.[2] The climate is now changing much faster than it has in the recent past. This is because people are putting heat-trapping greenhouse gases in Earth's atmosphere. When people talk about climate change they are usually talking about the problem of human-caused global warming[16], which is happening now (see global warming for more details). But the climate of the Earth has changed over not just thousands of years, but tens or hundreds of millions of years.[3]

Sometimes, before there were people, the Earth's climate was much hotter than it is today. For example about 60 million years ago there were a lot of volcanoes, which burnt a lot of underground organic matter[17] (squashed and fossilized dead plants and animals like coal, gas and oil) so a lot of carbon dioxide and methane went up in the air like nowadays.[4] This made the Earth hot enough for giant tortoises and alligators to live in the Arctic.[4]

At times in the past, the temperature was much cooler, with the last glaciation ending about ten thousand years ago.[5][3] Ice Ages are long times when the Earth got colder, and more ice froze at the North and South Poles.[6] Sometimes even the whole Earth was covered in ice, and was much colder than today.[7][8] There is no one reason why there are Ice Ages. Changes in the Earth's orbit around the Sun, and the Sun getting brighter or dimmer are events which do happen.[6] Also how much the Earth is tilted compared to the Sun might make a difference.[9] Another source of change is the activities of living things[18] (see Great Oxygenation Event and Huronian glaciation).[10][11]

A levee, or levée, is a raised bank of a river. The levee or dyke is a protection against floods.[1][2][3] There are two types of levee: riverdykes and seadykes.[19]

The seadyke was invented in Holland in 1277. Rotterdam is largely below sea level, but is protected by its dykes. It is quite clear now that other coastal cities are going to need protection from the sea.[20]

The first dykes were built in ancient Mesopotamia. The levees they used were earth walls and gave protection against the meltwater. 3000 years ago levees were used in ancient Egypt for irrigation systems.[21]

'Levée' comes from the French verb lever, "to raise". Other names are 'floodbank' or 'stopbank'. It is a natural or artificial wall, usually earthen, and often parallels the course of a river. The term "levee" came into English use in New Orleans around 1672. The word 'dyke' or 'dike' comes from the Dutch word dijk.[22]

The general term for devices such as dykes is "flood control". Another useful term is "embankment", which is used to build up banks of a river The lower River Thames was a broad, shallow waterway winding through malarious marshlands. It has been transformed into a deep, narrow tidal canal. Floods from the North Sea are held back at the Thames Barrier.[23]

The Stern Review on the Economics of Climate Change is a 700-page report released on 30 October 2006 by economist Lord Nicholas Stern for the British government.[24]

It discusses the effect of climate change and global warming on the world economy. It is the largest and most widely known and discussed report of its kind.[1] Nicholas Stern, called the "world's top climate economist", endorses 350 ppm as "a very sensible long-term target."[2]

Lord Stern is the co-chairperson of the of Global Commission for the Economy and Climate.[3][4]

Pollution is when harmful substances are added to the environment and then change it in a bad way. There are five kinds of pollution of the environment: water pollution, air pollution, noise pollution, soil pollution and thermal pollution.[25]

As pollution grows, ways to combat it have been in demand. Solar energy and wind energy give people clean opportunities to power their homes. But these may also have environmental issues depending on the situation. When people use these alternative forms of energy, they put less carbon dioxide into the environment.[1]

The Intergovernmental Panel on Climate Change (IPCC) is a group of scientists chosen by governments and other large groups from around the world who study the way that humans are making the Earth heat up unnaturally. The group was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), two organizations of the United Nations.[26]

The IPCC shared the 2007 Nobel Peace Prize with former Vice President of the United States Al Gore who won for working on the same problems.[1]

A lot of IPCC work is publishing reports about the United Nations Framework Convention on Climate Change (UNFCCC),[2] an international agreement that human inventions and chemistry may make the Earth too hot to live on. The UNFCCC was the beginning of the Kyoto Protocol. Members of the IPCC read, write, and calculate as much as they can. Only member states of the WMO and UNEP may be members of IPCC. A lot of professors trust the IPCC work.[3][4]

III.RESULTS

The greenhouse effect occurs when certain gases in the Earth's atmosphere (the air around the Earth) trap infrared radiation. This makes the planet become warmer, similar to the way a greenhouse becomes warmer.[1]

The most important greenhouse gases in Earth's atmosphere are: water vapor, carbon dioxide(CO_2), and methane. [27]When there is more greenhouse gas in the air, the air holds more heat. This is why more greenhouse gases cause climate change and global warming.[2]

The greenhouse effect is natural.[50] It is important for life on Earth. Without the greenhouse effect, the Earth's average temperature would be around –18 or –19 degrees Celsius (0 or 1 degree Fahrenheit). Earth would be locked in an ice age. Because of the greenhouse effect, the Earth's actual average temperature is 14 degrees Celsius (57 degrees Fahrenheit).[28]

The problem is that recently, the greenhouse effect has become stronger. This is because humans have been burning large amounts of fossil fuels[51], which releases carbon dioxide. Since carbon dioxide is a greenhouse gas, it has caused the planet to warm over the past 150 years.[29]

About 10,000 years ago, before people started burning large amounts of fossil fuels, there were 260 to 280 parts per million (ppm) of carbon dioxide (CO2) in the atmosphere, but now there is over 400 ppm. Most scientists say that having 350 ppm or less is safe for the environment and that species on the planet can adapt to this level. Higher levels can make severe problems for animal and marine life that are already being seen today, such as ocean acidification.[30]

The greenhouse effect was first proposed by Joseph Fourier in 1824. Mars, Venus and other planets with atmospheres also have greenhouse effects. The effect on Venus is especially strong because Venus has so much CO_2.[49] This is why Venus is hotter than Mercury, even though [31] Mercury is closer to the sun. The first person to predict that carbon dioxide from the burning of fossil fuels (and other combustion processes) could cause global warming was Nobel Prize winner Svante Arrhenius.[32]

Sometimes, before there were people, the Earth's climate was much hotter than it is today. For example about 60 million years ago[48] there were a lot of volcanoes, which burnt a lot of underground organic matter (squashed and fossilized dead plants and animals like coal, gas and oil) so a lot of carbon dioxide and methane went up in the air like nowadays.[4] This made the Earth hot enough for giant tortoises and alligators to live in the Arctic.[4] Ice Ages are long times (much much longer than glaciations)[33] when the Earth got colder, and more ice froze at the North and South Poles.[6] Sometimes even the whole Earth was covered in ice, and was much colder than today.[7][8] There is no one reason why there are Ice Ages. Changes in the Earth's orbit around the Sun, and the Sun getting brighter or dimmer are events which do happen.[6] Also how much the Earth is tilted compared to the Sun might make a difference.[9] Another source of change is the activities of living things (see Great Oxygenation Event and Huronian glaciation).[10][11] Joseph Fourier in 1824,[47] Claude Pouillet in 1827 and 1838, Eunice Foote (1819–1888) in 1856, Irish physicist John Tyndall (1820–1893) in 1863 onwards,[12] Svante Arrhenius in 1896, and Guy Stewart Callendar (1898–1964) [34]discovered the importance of carbon dioxide (CO_2) in climate change. Foote's work was not appreciated, and not widely known. Tyndall proved there were other greenhouse gases as well. Nils Gustaf Ekholm in 1901 invented the term.[13][14] The Sun gets a little bit hotter and colder every 11 years. This is called the 11-year sunspot cycle. The change is so small that scientists can barely measure how it affects the temperature of the Earth[35]. If the Sun was causing the Earth to warm up, it would warm both the surface and high up in the air. But the air in the upper stratosphere is actually getting colder. Therefore the changes in the Sun are not causing the global warming which is happening now.[36]

IV.CONCLUSIONS

The Intergovernmental Panel on Climate Change (IPCC) is a group of scientists chosen by governments and other large groups from around the world who study the way that humans are making the Earth heat up unnaturally[46]. The group was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), two organizations of the United Nations.[37]

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The first IPCC report was published in 1990. More was added to that report in 1992. The second report was published in 1995, the third was published in 2001, and a fourth in 2007. Each report is in three books called Working Groups 1, 2 and 3. [45]Most times "the IPCC report" means the Working Group I report, which is about basic climate change. [39]The Fourth Assessment Report (AR4) was completed in early 2007.[5] Like earlier IPCC reports, it contains four reports, three of them from its working groups.[40]

Working Group 1 was about the "Physical Science Basis of Climate Change." The Working Group 1 report was published on February 2 2007[6] and revised on February 2007.[7] There was also a February 2 2007 press release.[8] The full Working Group 1 report[9] was published in March. The main report says:[10]

- Warming of the climate system is unequivocal.[41]
- Most of the increase in globally averaged temperatures since the middle of the 20th century is very likely to be caused by humans using gases such as carbon dioxide, methane, and CFCs.[42]
- Warming and sea level rise will continue for centuries, even if greenhouse gas was not used any more, the amount of warming and sea level rise depends on how much fossil fuel is burnt for the next 100 years (pages 14 and 18).[7]
- The chance that global warming and rising sea levels is natural is less than 5%.
- World temperatures could rise by between 1.1 and 6.4 °C (2.0 and 11.5 °F) during the 21st century (table 3) and:[43]
  - Sea levels may rise by 18 to 59 cm (7.08 to 23.22 in) [table 3].
- Both past and future carbon dioxide production will continue to make global warming and sea level rise for more than a thousand years.
- Carbon dioxide, methane, and nitrous oxide in the atmosphere have increased a lot because of human activities since 1750[44]

The Summary for Policymakers for the Working Group 2 (IPCC wg2 Archived 2008-12-20 at the Wayback Machine) report was published on April 6, 2007.[11] The Summary for Policymakers for the Working Group 3 report [12] was published on May 4, 2007.[45]

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