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Global Warming, Acid Rain and Greenhouse Effect

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ABSTRACT:

Global Warming

In the atmosphere greenhouse effect is mainly due to the carbon dioxide layer. In the upper atmosphere, there is a protective layer of ozone. This ozone layer does not allow the ultraviolet radiation to enter into the earth's atmosphere. Lower atmosphere contains carbon dioxide which traps the infrared radiation from different sources and maintains a suitable temperature. If there is an excess of carbon dioxide in the atmosphere, the temperature of the earth increases which is called global warming.

Acid rain

When the various gases like CO_2, SO_2, NO_2, combine with rainwater then their respective acids will be produced. These acids will react on the ground along with rain water in the cocktail form. This process is called acid rain. In the atmosphere, these gases react with water vapour and formed their corresponding acids like H_2CO3, H_2SO4, and others. When rainfall occurs these acids get mixed with rain and forms acid rain.

Effect of acid rain

1. The acidity of the soil increases which causes the reduction of productivity of the soil.
2. The acidity of water bodies increases which cause the decline in the population of aquatic organism.

Green House Effect

The artificial house which is made by glass or plastic inside which the temperature will be more than the outer environmental temperature is called greenhouse. The artificial greenhouse provides controlled environment for plants.

Examples of Green House Effect

1. The interior of a car parked in the sunshine with its window becomes very hot due to the greenhouse effect.
2. Rooms of a house in cold countries whose windows are closed and sunlight fall on then become warm due to the greenhouse.
3. Solar cookers and solar furnace are heated due to the greenhouse effect.

Advantages of artificial greenhouse

1. It provides the controlled environment for plants inside it. The plants which can be found in the desert can be grown in the Himalayan region inside it.
2. Those plants which are obtained in summer can be planted in winter inside it.

The Atmosphere of the Earth is Natural Green House

The water vapours and carbon dioxide in the atmosphere are good observers of infra-red radiation of longer wavelengths than that of the infra-red radiations of shorter wavelengths. The solar radiation passes easily through the atmosphere. The heat radiations passing through the atmosphere are observed by the earth's surface and various

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objects like plants, water and rocks. The temperature of the earth increases. The earth's atmosphere emits infrared radiation of longer wavelengths. These infrared radiations of longer wavelengths are absorbed by water vapours and carbon dioxide in the atmosphere. Due to this heat radiation, the warming of the earth's atmosphere takes place.

KEYWORDS: global warming, acid rain, green house effect, atmosphere, earth, temperature, ozone

I. INTRODUCTION

Global warming is the long-term heating of Earth's surface observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere. This term is not interchangeable with the term "climate change."

Since the pre-industrial period, human activities are estimated to have increased Earth's global average temperature by about 1 degree Celsius (1.8 degrees Fahrenheit), a number that is currently increasing by more than 0.2 degrees Celsius (0.36 degrees Fahrenheit) per decade. The current warming trend is unequivocally the result of human activity since the 1950s and is proceeding at an unprecedented rate over millennia.

Global warming is the long-term warming of the planet's overall temperature. Though this warming trend has been going on for a long time, its pace has significantly increased in the last hundred years due to the burning of fossil fuels. As the human population has increased, so has the volume of fossil fuels burned. Fossil fuels include coal, oil, and natural gas, and burning them causes what is known as the "greenhouse effect" in Earth's atmosphere.
The greenhouse effect is when the Sun's rays penetrate the atmosphere, but when that heat is reflected off the surface cannot escape back into space. Gases produced by the burning of fossil fuels prevent the heat from leaving the atmosphere. These greenhouse gasses are carbon dioxide, chlorofluorocarbons, water vapor, methane, and nitrous oxide. The excess heat in the atmosphere has caused the average global temperature to rise overtime, otherwise known as global warming.

Global warming has presented another issue called climate change. Sometimes these phrases are used interchangeably, however, they are different. Climate change refers to changes in weather patterns and growing seasons around the world. It also refers to sea level rise caused by the expansion of warmer seas and melting ice sheets and glaciers. Global warming causes climate change, which poses a serious threat to life on earth in the forms of widespread flooding and extreme weather. Scientists continue to study global warming and its impact on Earth.
Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. But since the 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil and gas.

Burning fossil fuels generates greenhouse gas emissions that act like a blanket wrapped around the Earth, trapping the sun's heat and raising temperatures.

Examples of greenhouse gas emissions that are causing climate change include carbon dioxide and methane. These come from using gasoline for driving a car or coal for heating a building, for example. Clearing land and forests can also release carbon dioxide. Landfills for garbage are a major source of methane emissions. Energy, industry, transport, buildings, agriculture and land use are among the main emitters.

And emissions continue to rise. As a result, the Earth is now about 1.1°C warmer than it was in the late 1800s. The last decade (2011) was the warmest on record.

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Many people think climate change mainly means warmer temperatures. But temperature rise is only the beginning of the story. Because the Earth is a system, where everything is connected, changes in one area can influence changes in all others. The consequences of climate change now include, among others, intense droughts, water scarcity, severe fires, rising sea levels, flooding, melting polar ice, catastrophic storms and declining biodiversity.

Acid rain, or acid deposition, is a broad term that includes any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. This can include rain, snow, fog, hail or even dust that is acidic. Acid rain results when sulfur dioxide (SO_2) and nitrogen oxides (NO_X) are emitted into the atmosphere and transported by wind and air currents. The SO_2 and NO_X react with water, oxygen and other chemicals to form sulfuric and nitric acids. These then mix with water and other materials before falling to the ground.

While a small portion of the SO_2 and NO_X that cause acid rain is from natural sources such as volcanoes, most of it comes from the burning of fossil fuels. The major sources of SO_2 and NO_X in the atmosphere are:

- Burning of fossil fuels to generate electricity. Two thirds of SO_2 and one fourth of NO_X in the atmosphere come from electric power generators.
- Vehicles and heavy equipment.
- Manufacturing, oil refineries and other industries.

Winds can blow SO_2 and NO_X over long distances and across borders making acid rain a problem for everyone and not just those who live close to these sources.

II. DISCUSSION

Forms of Acid Deposition

Wet Deposition

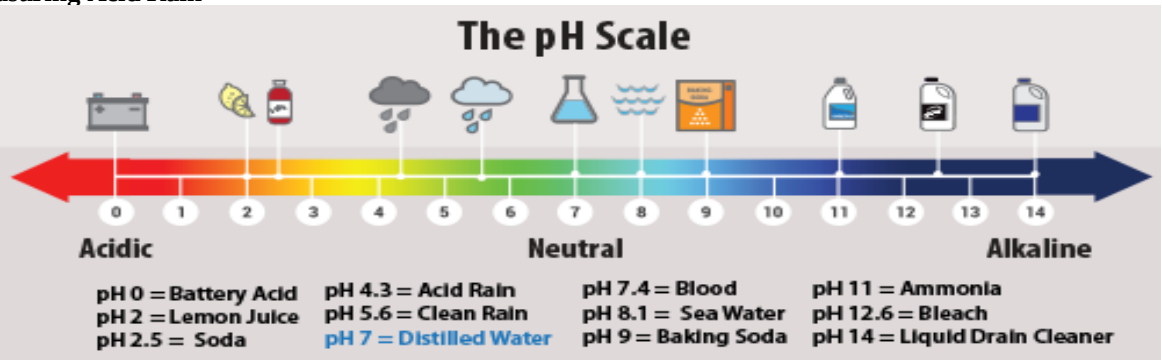
Wet deposition is what we most commonly think of as **acid rain**. The sulfuric and nitric acids formed in the atmosphere fall to the ground mixed with rain, snow, fog, or hail.

Dry Deposition

Acidic particles and gases can also deposit from the atmosphere in the absence of moisture as **dry deposition**. The acidic particles and gases may deposit to surfaces (water bodies, vegetation, buildings) quickly or may react during atmospheric transport to form larger particles that can be harmful to human health. When the accumulated acids are washed off a surface by the next rain, this acidic water flows over and through the ground, and can harm plants and wildlife, such as insects and fish.

The amount of acidity in the atmosphere that deposits to earth through dry deposition depends on the amount of rainfall an area receives. For example, in desert areas the ratio of dry to wet deposition is higher than an area that receives several inches of rain each year.

Measuring Acid Rain



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Acidity and alkalinity are measured using a pH scale for which 7.0 is neutral. The lower a substance's pH (less than 7), the more acidic it is; the higher a substance's pH (greater than 7), the more alkaline it is. Normal rain has a pH of about 5.6; it is slightly acidic because carbon dioxide (CO_2) dissolves into it forming weak carbonic acid. Acid rain usually has a pH between 4.2 and 4.4.

Policymakers, research scientists, ecologists, and modelers rely on the National Atmospheric Deposition Program's (NADP) National Trends Network (NTN) for measurements of wet deposition. The NADP/NTN collects acid rain at more than 250 monitoring sites throughout the US, Canada, Alaska, Hawaii and the US Virgin Islands. Unlike wet deposition, dry deposition is difficult and expensive to measure. Dry deposition estimates for nitrogen and sulfur pollutants are provided by the Clean Air Status and Trends Network (CASTNET). Air concentrations are measured by CASTNET at more than 90 locations.

When acid deposition is washed into lakes and streams, it can cause some to turn acidic. The Long-Term Monitoring (LTM) Network measures and monitors surface water chemistry at over 280 sites to provide valuable information on aquatic ecosystem health and how water bodies respond to changes in acid-causing emissions and acid deposition.
Global warming occurs when carbon dioxide (CO_2) and other air pollutants collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface. Normally this radiation would escape into space, but these pollutants, which can last for years to centuries in the atmosphere, trap the heat and cause the planet to get hotter. These heat-trapping pollutants—specifically carbon dioxide, methane, nitrous oxide, water vapor, and synthetic fluorinated gases—are known as greenhouse gases, and their impact is called the greenhouse effect.Though natural cycles and fluctuations have caused the earth's climate to change several times over the last 800,000 years, our current era of global warming is directly attributable to human activity—specifically to our burning of fossil fuels such as coal, oil, gasoline, and natural gas, which results in the greenhouse effect. In the United States, the largest source of greenhouse gases is transportation (29 percent), followed closely by electricity production (28 percent) and industrial activity (22 percent). Learn about the natural and human causes of climate change.

Curbing dangerous climate change requires very deep cuts in emissions, as well as the use of alternatives to fossil fuels worldwide. The good news is that countries around the globe have formally committed—as part of the Paris Climate Agreement—to lower their emissions by setting new standards and crafting new policies to meet or even exceed those standards. The not-so-good news is that we're not working fast enough. To avoid the worst impacts of climate change, scientists tell us that we need to reduce global carbon emissions by as much as 40 percent by future. For that to happen, the global community must take immediate, concrete steps: to decarbonize electricity generation by equitably transitioning from fossil fuel–based production to renewable energy sources like wind and solar; to electrify our cars and trucks; and to maximize energy efficiency in our buildings, appliances, and industries.Scientists agree that the earth's rising temperatures are fueling longer and hotter heat waves, more frequent droughts, heavier rainfall, and more powerful hurricanes.In latest news, for example, scientists concluded that a lengthy drought in California—the state's worst water shortage in 1,200 years—had been intensified by 15 to 20 percent by global warming. They also said the odds of similar droughts happening in the future had roughly doubled over the past century. And further, the National Academies of Science, Engineering, and Medicine announced that we can now confidently attribute some extreme weather events, like heat waves, droughts, and heavy precipitation, directly to climate change.

The earth's ocean temperatures are getting warmer, too—which means that tropical storms can pick up more energy. In other words, global warming has the ability to turn a category 3 storm into a more dangerous category 4 storm. In fact, scientists have found that the frequency of North Atlantic hurricanes has increased since the early 1980s, as has the number of storms that reach categories 4 and 5. The future Atlantic hurricane season included a record-breaking 30 tropical storms, 6 major hurricanes, and 13 hurricanes altogether. With increased intensity come increased

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damage and death. The United States saw an unprecedented 22 weather and climate disasters that caused at least a billion dollars' worth of damage and was the costliest on record and among the deadliest as well: Taken together, that year's tropical storms (including Hurricanes Harvey, Irma, and Maria) caused nearly $300 billion in damage and led to more than 3,300 fatalities.The impacts of global warming are being felt everywhere. Extreme heat waves have caused tens of thousands of deaths around the world in recent years. And in an alarming sign of events to come, Antarctica has lost nearly four trillion metric tons of ice since the 1990s. The rate of loss could speed up if we keep burning fossil fuels at our current pace, some experts say, causing sea levels to rise several meters in the next 50 to 150 years and wreaking havoc on coastal communities worldwide.Each year scientists learn more about the consequences of global warming, and each year we also gain new evidence of its devastating impact on people and the planet. As the heat waves, droughts, and floods associated with climate change become more frequent and more intense, communities suffer and death tolls rise. If we're unable to reduce our emissions, scientists believe that climate change could lead to the deaths of more than 250,000 people around the globe every year and force 100 million people into poverty by future.

Global warming is already taking a toll on the United States. And if we aren't able to get a handle on our emissions, here's just a smattering of what we can look forward to:

- Disappearing glaciers, early snowmelt, and severe droughts will cause more dramatic water shortages and continue to increase the risk of wildfires in the American West.
- Rising sea levels will lead to even more coastal flooding on the Eastern Seaboard, especially in Florida, and in other areas such as the Gulf of Mexico.
- Forests, farms, and cities will face troublesome new pests, heat waves, heavy downpours, and increased flooding. All of these can damage or destroy agriculture and fisheries.
- Disruption of habitats such as coral reefs and alpine meadows could drive many plant and animal species to extinction.
- Allergies, asthma, and infectious disease outbreaks will become more common due to increased growth of pollen-producing ragweed, higher levels of air pollution, and the spread of conditions favorable to pathogens and mosquitoes.

Though everyone is affected by climate change, not everyone is affected equally. Indigenous people, people of color, and the economically marginalized are typically hit the hardest. Inequities built into our housing, health care, and labor systems make these communities more vulnerable to the worst impacts of climate change—even though these same communities have done the least to contribute to it. In recent years, China has taken the lead in global-warming pollution, producing about 26 percent of all CO2 emissions. The United States comes in second. Despite making up just 4 percent of the world's population, our nation produces a sobering 13 percent of all global CO2 emissions—nearly as much as the European Union and India (third and fourth place) combined. And America is still number one, by far, in cumulative emissions over the past 150 years. As a top contributor to global warming, the United States has an obligation to help propel the world to a cleaner, safer, and more equitable future. Our responsibility matters to other countries, and it should matter to us, too. We've started. But in order to avoid the worsening effects of climate change, we need to do a lot more—together with other countries—to reduce our dependence on fossil fuels and transition to clean energy sources.Under the administration of President Donald Trump (a man who falsely referred to global warming as a "hoax"), the United States withdrew from the Paris Climate Agreement, rolled back or eliminated dozens of clean-air protections, and opened up federally managed lands, including culturally sacred national monuments, to fossil fuel development. Although President Biden has pledged to get the country back on track, years of inaction during and before the Trump administration—and our increased understanding of global warming's serious impacts—mean we must accelerate our efforts to reduce greenhouse gas emissions.Despite the lack of cooperation from the Trump administration, local and state governments made great strides during this period through efforts like the American Cities Climate Challenge and ongoing collaborations like the Regional Greenhouse Gas Initiative. Meanwhile, industry and business leaders have been working with the public sector, creating and adopting new clean-energy technologies and increasing energy

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efficiency in buildings, appliances, and industrial processes. Today the American automotive industry is finding new ways to produce cars and trucks that are more fuel efficient and is committing itself to putting more and more zero-emission electric vehicles on the road. Developers, cities, and community advocates are coming together to make sure that new affordable housing is built with efficiency in mind, reducing energy consumption and lowering electric and heating bills for residents. And renewable energy continues to surge as the costs associated with its production and distribution keep falling. In further news the renewable energy sources such as wind and solar provided more electricity than coal for the very first time in U.S. history.

President Biden has made action on global warming a high priority. On his first day in office, he recommitted the United States to the Paris Climate Agreement, sending the world community a strong signal that we were determined to join other nations in cutting our carbon pollution to support the shared goal of preventing the average global temperature from rising more than 1.5 degrees Celsius above preindustrial levels. (Scientists say we must stay below a 2-degree increase to avoid catastrophic climate impacts.) And significantly, the president has assembled a climate team of experts and advocates who have been tasked with pursuing action both abroad and at home while furthering the cause of environmental justice and investing in nature-based solutions. While we can't win the fight without large-scale government action at the national level, we also can't do it without the help of individuals who are willing to use their voices, hold government and industry leaders to account, and make changes in their daily habits.

Wondering how you can be a part of the fight against global warming? Reduce your own carbon footprint by taking a few easy steps: Make conserving energy a part of your daily routine and your decisions as a consumer. When you shop for new appliances like refrigerators, washers, and dryers, look for products with the government's ENERGY STAR® label; they meet a higher standard for energy efficiency than the minimum federal requirements. When you buy a car, look for one with the highest gas mileage and lowest emissions. You can also reduce your emissions by taking public transportation or carpooling when possible.And while new federal and state standards are a step in the right direction, much more needs to be done. Voice your support of climate-friendly and climate change preparedness policies, and tell your representatives that equitably transitioning from dirty fossil fuels to clean power should be a top priority—because it's vital to building healthy, more secure communities.You don't have to go it alone, either. Movements across the country are showing how climate action can build community, be led by those on the front lines of its impacts, and create a future that's equitable and just for all.

III. RESULTS

The planet is warming, from North Pole to South Pole. Since 1906, the global average surface temperature has increased by more than 1.6 degrees Fahrenheit (0.9 degrees Celsius)—even more in sensitive polar regions. And the impacts of rising temperatures aren't waiting for some far-flung future–the effects of global warming are appearing right now. The heat is melting glaciers and sea ice, shifting precipitation patterns, and setting animals on the move.Many people think of global warming and climate change as synonyms, but scientists prefer to use "climate change" when describing the complex shifts now affecting our planet's weather and climate systems. Climate change encompasses not only rising average temperatures but also extreme weather events, shifting wildlife populations and habitats, rising seas, and a range of other impacts. All of these changes are emerging as humans continue to add heat-trapping greenhouse gases to the atmosphere.

Scientists already have documented these impacts of climate change:

- Ice is melting worldwide, especially at the Earth's poles. This includes mountain glaciers, ice sheets covering West Antarctica and Greenland, and Arctic sea ice. In Montana's Glacier National Park the number of glaciers has declined to fewer than 30 from more than 150 in 1910.
- Much of this melting ice contributes to sea-level rise. Global sea levels are rising 0.13 inches (3.2 millimeters) a year. The rise is occurring at a faster rate in recent years and is predicted to accelerate in the coming decades.

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- Rising temperatures are affecting wildlife and their habitats. Vanishing ice has challenged species such as the Adélie penguin in Antarctica, where some populations on the western peninsula have collapsed by 90 percent or more.
- As temperatures change, many species are on the move. Some butterflies, foxes, and alpine plants have migrated farther north or to higher, cooler areas.
- Precipitation (rain and snowfall) has increased across the globe, on average. Yet some regions are experiencing more severe drought, increasing the risk of wildfires, lost crops, and drinking water shortages.
- Some species—including mosquitoes, ticks, jellyfish, and crop pests—are thriving. Booming populations of bark beetles that feed on spruce and pine trees, for example, have devastated millions of forested acres in the U.S.Other effects could take place later this century, if warming continues. These include:
- Sea levels are expected to rise between 10 and 32 inches (26 and 82 centimeters) or higher by the end of the century.
- Hurricanes and other storms are likely to become stronger. Floods and droughts will become more common. Large parts of the U.S., for example, face a higher risk of decades-long "megadroughts" by 2100.
- Less freshwater will be available, since glaciers store about three-quarters of the world's freshwater.
- Some diseases will spread, such as mosquito-borne malaria
- Ecosystems will continue to change: Some species will move farther north or become more successful; others, such as polar bears, won't be able to adapt and could become extinct.
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IV. CONCLUSIONS

Both acid deposition and changes in the global atmosphere and climate affect terrestrial and aquatic ecosystems. In the atmosphere sulphate aerosols tend to increase haze, altering the global radiation balance. Increased nitrogen deposition to N-limited systems such as boreal forests results in increased growth and increased sequestration of atmospheric CO_2, slowing the increase in CO_2 levels in the atmosphere. Future reduction in S and N emissions may result in a trade-off -- better with respect to some effects of acid deposition and greenhouse warming, but worse with respect to others. Global warming may cause the incidence and severity of drought to increase. Mineralisation of N and oxidation of organic S compounds release pulses of SO_4, acid and Al to surface waters. Effects in lakes may include reduced deep water refugia for cold stenotherms, lower nutrient concentrations, and greater penetration of harmful UV radiation. Longer water renewal times cause declines in SO_4 and NO_3, due to increased in situ removal, but increases in base cations. The net result is increased internal alkalinity production. In areas characterised by cold winters, global warming may result in a major shift in hydrologic cycle, with snowmelt episodes occurring during the winter rather than the typical pattern of accumulation in the winter and melting in the spring. Increased storm frequency predicted for the future will cause increased frequency and severity of sea salt episodes in coastal regions. Predicting the interactions of regional and global environmental factors in the coming decades poses new challenges to scientists, managers and policy-makers.

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