Climate change and Global Worming

Climate change is defined as any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for a long period of time usually several years. The factors which could lead to climate change vary but include natural factors, such as changes in the sun's intensity, slow changes in the earth's orbit around the sun, natural processes within the climate system (such as changes in ocean circulation) and human activities that change the atmosphere's composition (such as through the burning of fossil fuels) and the land surface (such as deforestation, reforestation, urbanization and desertification).

Global warming is defined as an average increase in the temperature of the atmosphere near the earth's surface and in the troposphere (rising average temperature of the earth's atmosphere and oceans), which can contribute to changes in global climate patterns. Global warming can occur due to different sources which may be natural or anthropogenic, especially as a result of increased emissions of greenhouse gases from human activities. Light energy come from sun and it is absorbed by earth and converted to heat energy at the planet surface. The infrared heat energy radiates back ward due to atmosphere in to space. The greenhouse gases present naturally in troposphere which are absorb some of infrared radiation and reradiate it back toward surface, greenhouse gases like blanket, delaying loss infrared to space.18000 years ago, global temperature were 3-5 ^{O}C colder than they are today. **During Global cooling,** earth's atmosphere is subject cooling factor. Average cloud cover 50% of earth's surface and about 21% reflect of solar radiation to the space, this reflation of sun light is called planetary albedo which it contributes overall cooling.

Greenhouse gases

Greenhouse gases which are responsible global warming, include carbon dioxide (CO_2) 50%, water vapor 2%, ozone (O_3) 8%, methane (CH_4) 19%, nitrous oxide (N_2O)4% and chlorofluorocarbon (CFCs) 17%.

Carbon dioxide (CO_2) is produced and release in to atmosphere where the organic material (material contain carbon) is burned. Fossil fuel (petrol, diesel and coal) is the major source of increase of carbon dioxide at the rate of 1-2 per cent per year, that cause increasing temperature as 2^oC in the next 100 years, electrical power and deforestation are other sources. The level in air has increased from 280ppm to 350 ppm at present two centuries. The volcanic eruption, decay and decompose organic matter naturally, plant and animal respiration are constantly added CO_2 to the atmosphere. In some condition, the CO_2 gas remove constantly from atmosphere by absorbed due to water (occur in ocean), and save in animal and plant tissue especially use in photosynthesis mechanism.

Other greenhouse gas is **Methane**, it is a second important factor to forming global warming. Methane has ability 2.5 times greater than CO_2 to absorb infrared radiation. It forming due to increase agriculture, livestock, rice production, incomplete burning organic matter (coal mine), oil well and microbial fermentative reaction. Also, other source for methane generation is stomach of ruminants and animal husbandry that responsible for increase this gas in troposphere.

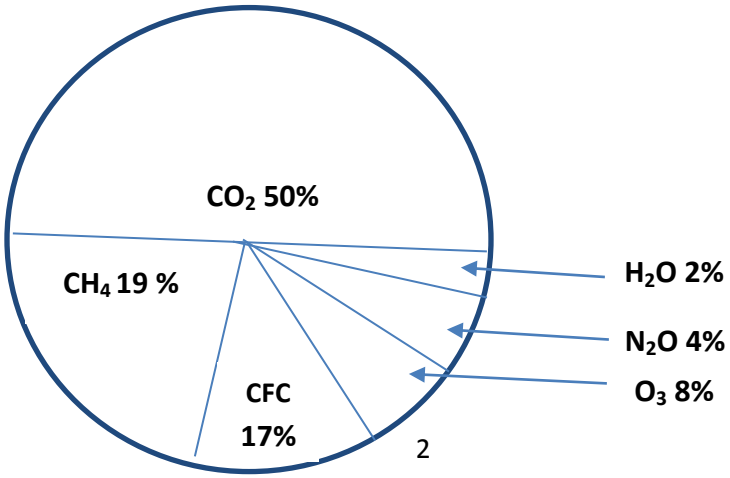


Fig: Greenhouse gases

Nitrous oxide (N_2O) is other factor to increase global, it can ability **300 times** greater than **CO_2** to absorb infrared radiation, the sources of N_2O are human activities such as

- Soil fertilizer, chemical fertilizer or nitrogen fertilizer.
- Fossil fuel burning release this gas to atmosphere.

  The natural source is breakdown reactive nitrogen in soil by bacteria and ocean water.

  Other factor to increasing global warming are **ozone** (**ground level ozone**) and chlorofluorocarbon (CFCs). Ozone forms from VOCs +nitrogen dioxide by present heat and ultraviolet of sun. The CFCs) have a potent greenhouse gas effect, anthropogenic are main source to generate this gas such as refrigerator and split system air condition. Finally, **water vapor** absorbed infrared energy, the concentration of water vapor in troposphere is variable through the evaporation and precipitation.

Effect of global warming

Effect on climate:

1- Extreme weather will increase in some area and have adverse effect on plant and animal such as:
   - heat wave
   - drought
   - rain storm
   - increase forest fire
   - expand desert
   - Reduce crop production
   - melting of polar ice and glacier will increase
   - rise sea level

- leading to flooding
- kill large number of people.

2- In temperate area, summer will be longer and hotter and winter shorter and warmer.

3- Subtropical region will become drier and tropical region wetter.

4- Climate change will threaten biodiversity as following:

- Change in climate are affecting physical properties of ecosystem. The warmer climate expands ranges and population pf some organisms that can adapted to the change such as insect (fire ants beetle) that kills tress, some types of insect and fungi damage trees.
- In warmer region, insect, microbes and fungi will rapidly increase that make sick and premature death due to increase Malaria, diarrhea and malnutrition.
- Some Plants produced pollens, these pollens increase and cause allergic or asthma.
- About 30% of plant and animal species disappear if the global temperature changes 1.5-2.5 ^{o}C, could grow 70% if temperature change 3-5^{o}C.

5- High atmospheric temperature will increase air pollution by increase the rate of chemical reaction which produce photochemical smog.

6- Increase soil erosion, contamination of fresh water and increase water borne diseases.

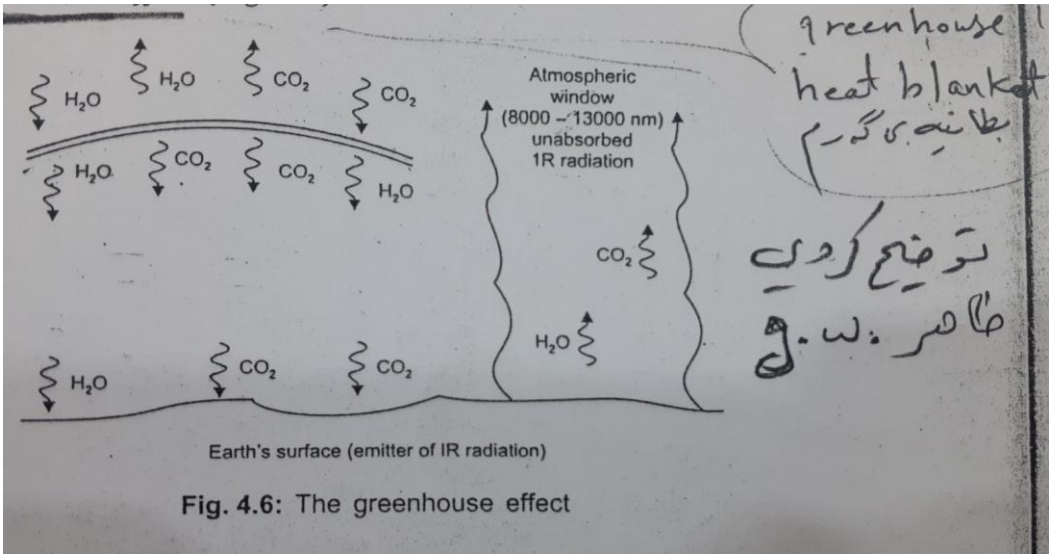


Fig. 4.6: The greenhouse effect

Fig: Greenhouse effect

Note:

- With 450 ppm CO2 cause warming increasing by 2 ^{0}C.
- With 550 ppm CO2 cause warming increasing by 3 ^{0}C.
- With 650 ppm CO2 cause warming increasing by 4 ^{0}C.

- Each 100 ppm from CO2 that increase 1 ^{0}C.
- According to NASA agency 2007, about 45%of worlds land area could suffer of extreme drought in 2059.
- In 2005 WHO, studied that climate change already effect more than 250 million people contribute to premature death, the number could be double in 2030, most death caused by increase malaria, diarrhea, malnutrition and flooding.
- About 30% of plants and animals' species could disappear if the global temperature changes 1.5 to 2.5 ^{0} C temperature.

Reduce climate change by:

1-Reduce or avoid use fossil fuel by encouraging, use renewable energy source like solar radiation energy, biofuel, wind energy and hydrolytic power energy.

2-Reduce deforestation and increase vegetation to serve a sink for carbon dioxide (stop cutting dawn of tropical forest).

3-Improve energy efficiency to reduce fossil fuel.

Erect a sea wall to prevent costal flooding as sea level rise.

Sara

Global Warming & Climate Change

What is the Earth's atmosphere?

The atmosphere is a layer of gases around the Earth. It protects the Earth's surface from the sun's harmful rays and contains the oxygen we breathe. The atmosphere is mostly nitrogen and oxygen, but it also contains smaller amounts of other gases, including those commonly referred to as 'greenhouse gases'. Greenhouse gases include carbon dioxide (CO2), methane, nitrous oxide and also water vapour.

What is Global Warming?

Global warming is the phenomenon of a gradual increase in the temperature near the earth's surface. This phenomenon has been observed over the past one or two centuries. This change has disturbed the climatic pattern of the earth. There are several causes of global warming, which have a negative effect on humans, plants and animals. These causes may be natural or might be the outcome of human activities. In order to curb the issues, it is very important to understand the negative impacts of global warming.

Causes of Global Warming

Following are the major causes of global warming:

Man-made Causes of Global Warming

Deforestation

Plants are the main source of oxygen. They take in carbon dioxide and release oxygen thereby maintaining environmental balance. Forests are being depleted for many domestic and commercial purposes. This has led to an environmental imbalance, thereby giving rise to global warming.

Use of Vehicles

The use of vehicles, even for a very short distance results in various gaseous emissions. Vehicles burn fossil fuels which emit a large amount of carbon dioxide and other toxins into the atmosphere resulting in a temperature increase.

Chlorofluorocarbon

With the excessive use of air conditioners and refrigerators, humans have been adding CFCs into the environment which affects the atmospheric ozone layer. The ozone layer protects the earth surface from the harmful ultraviolet rays emitted by the sun. The CFCs have led to ozone layer depletion making way for the ultraviolet rays, thereby increasing the temperature of the earth.

Industrial Development

With the advent of industrialization, the temperature of the earth has been increasing rapidly. The harmful emissions from the factories add to the increasing temperature of the earth.

Agriculture

Various farming activities produce carbon dioxide and methane gas. These add to the greenhouse gases in the atmosphere and increase the temperature of the earth.

Overpopulation

An increase in population means more people breathing. This leads to an increase in the level of carbon dioxide, the primary gas causing global warming, in the atmosphere.

Natural Causes of Global Warming

Volcanoes

Volcanoes are one of the largest natural contributors to global warming. The ash and smoke emitted during volcanic eruptions goes out into the atmosphere and affects the climate.

Water Vapour

Water vapour is a kind of greenhouse gas. Due to the increase in the earth's temperature, more water gets evaporated from the water bodies and stays in the atmosphere adding to global warming.

Melting Permafrost

Permafrost is frozen soil that has environmental gases trapped in it for several years and is present below Earth's surface. It is present in glaciers. As the permafrost melts, it releases the gases back into the atmosphere, increasing Earth's temperature.

Forest Blazes

Forest blazes or forest fires emit a large amount of carbon-containing smoke. These gases are released into the atmosphere and increase the earth's temperature resulting in global warming.

Effects of Global Warming

Following are the major effects of global warming:

Rise in Temperature

Global warming has led to an incredible increase in earth's temperature. Since 1880, the earth's temperature has increased by ~1 degrees. This has resulted in an increase in the melting of glaciers, which have led to an increase in the sea level. This could have devastating effects on coastal regions.

Threats to the Ecosystem

Global warming has affected the coral reefs that can lead to the loss of plant and animal lives. Increase in global temperatures has made the fragility of coral reefs even worse.

What do CFCs stand for? What is the role of CFC in global warming?

CFCs stand for chlorofluorocarbons. Ozone layer is responsible for protecting the surface of the earth from the sun's harmful radiations. CFCs destroy the ozone layer of the atmosphere. This makes the way for the ultraviolet rays to reach the earth, thus, increasing the temperature which leads to global warming.

How does global warming affect climate change?

The change in climatic conditions is a result of global warming. The burning of fossil fuels, cutting down of trees etc. causes the temperature of the earth to increase. High temperature changes the weather patterns, causing the dry areas to get drier and wet areas to get wetter. Thus, increasing the frequency of disasters like floods, droughts etc.

How can we control global warming?

The release of carbon dioxide and other greenhouse gases into the atmosphere is the major cause of global warming. It can be reduced by setting a high price of carbon, increasing the biofuels production from organic waste, use of renewable energy like solar and wind power, safeguarding forests and improving energy efficiency and vehicle fuel economy.

What is a climate change and its causes?

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. Human actions are causing Earth to warm by increasing the amount of carbon dioxide in the atmosphere.

The main causes of climate change include:

1. Emission of greenhouse gases into the atmosphere
2. Deforestation for human settlements
3. Overutilization and exploitation of natural resources
4. Pollution caused by human activities
5. Changes in solar output which is associated with sunspot activities
6. The aerosols that reach the atmosphere after volcanic eruptions

What are Greenhouse gases?

Greenhouse gases trap heat in the atmosphere. These are the gases causing greenhouse effect. Carbon dioxide (CO2) is the main greenhouse gas emitted through human activities.

What are the main greenhouse gases?

Major greenhouse gases are:

- Carbon dioxide
- Water Vapour
- Methane
- Ozone
- Nitrous oxide
- Chlorofluorocarbons

Greenhouse Gases Sources

As greenhouse gases are essential for the existence of life, they are present in the atmosphere in a trace amount.

- Natural sources of GHGs are volcanos, respiration by living organisms, decay and combustion of organic matter, etc.
- The amounts of GHGs are balanced in the atmosphere naturally by many physical, chemical or biochemical processes such as natural sinks that take-up CO_2, e.g. terrestrial vegetation
- Due to the industrial revolution and human intervention, the amount of greenhouse gases present in the atmosphere has drastically increased
- The main source of increased carbon dioxide in the atmosphere is the burning of fossil fuels, coal, petroleum and natural gas
- Urbanisation, deforestation and soil erosion has also contributed to the increased amount of carbon dioxide
- Various industries, solid and wastewater management are a source of increased methane. Rice cultivation has contributed considerably to increased greenhouse gases

The main ways to stop climate change :

- **Keep fossil fuels in the ground:**
  Fossil fuels include coal, oil and gas – and the more that are extracted and burned, the worse climate change will get. All countries need to move their economies away from fossil fuels as soon as possible.
- **Invest in renewable energy:**
  Changing our main energy sources to clean and renewable energy is the best way to stop using fossil fuels. These include technologies like solar, wind, wave, tidal and geothermal power.
- **Switch to sustainable transport:**
  Reducing car use, switching to electric vehicles and minimising plane travel will not only help stop climate change, it will reduce air pollution too.
- **Help us keep our homes cosy:**
  The government can help households heat our homes in a green way – such as by insulating walls and roofs and switching away from oil or gas boilers to heat pumps.
- **Improve farming and encourage vegan diets:**
  One of the best ways for individuals to help stop climate change is by reducing their meat and dairy consumption, or by going fully vegan. Businesses and food retailers can improve farming practices and provide more plant-based products to help people make the shift.

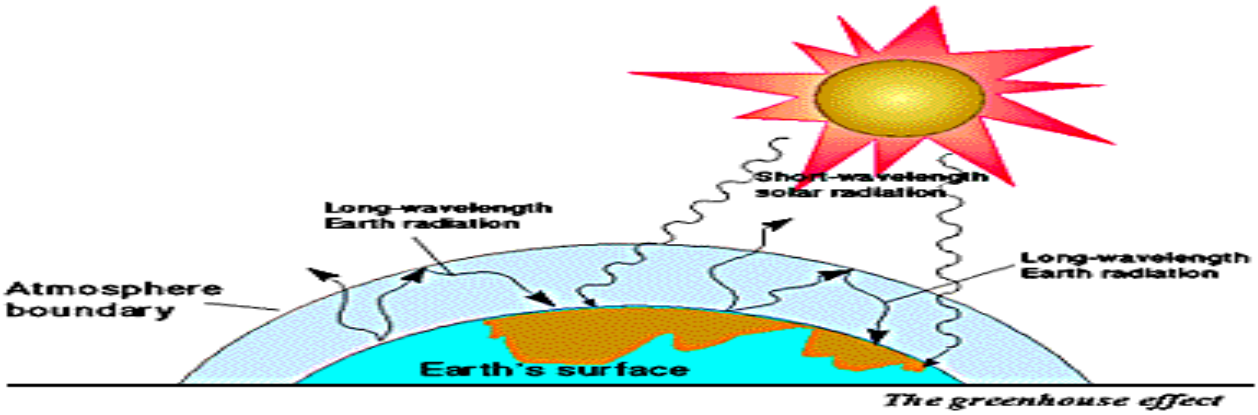
- **Restore nature to absorb more carbon:**

  The natural world is very good at cleaning up our emissions, but we need to look after it. Planting trees in the right places or giving land back to nature through ‘rewilding’ schemes is a good place to start. This is because photosynthesising plants draw down carbon dioxide as they grow, locking it away in soils.

- **Protect forests like the Amazon:**

  Forests are crucial in the fight against climate change, and protecting them is an important climate solution. Cutting down forests on an industrial scale destroys giant trees which could be sucking up huge amounts of carbon.
- **Protect the oceans:**
  Oceans also absorb large amounts of carbon dioxide from the atmosphere, which helps to keep our climate stable. But many are overfished, used for oil and gas drilling or threatened by deep sea mining. Protecting oceans and the life in them is ultimately a way to protect ourselves from climate change.

- **Reduce plastic:**
  Plastic is made from oil, and the process of extracting, refining and turning oil into plastic (or even polyester, for clothing) is surprisingly carbon-intense. It doesn't break down quickly in nature so a lot of plastic is burned, which contributes to emissions.



The greenhouse effect