



Climate change is the long-term alteration of temperature and typical weather patterns in a place. Climate change could refer to a particular location or the planet as a whole. Climate change may cause weather patterns to be less predictable.

Climate change is referred to as the changes in the ordinary weather found at a particular place over a period of time e.g. the usual weather, rainfall in rainy season, changes in winter season and spells, changes in summer season and spells etc in a particular place. Climate change also refers to changes in earth's climate in totality i.e. changes in earth's usual temperature (NASA).



Causes of climate change

Natural causes

- Volcanic eruption
- Ocean currents
- Earth orbital changes
- Solar variation

Human causes

- Green house gases
- Deforestation
- Coal mining
- Burning of fossil fuels

Natural causes



- Volcanic eruptions – volcanic eruption are responsible for releasing molten rock or lava from deep within the earth , forming new rock on the earth surface. But eruption also impact the atmosphere.
- volcanic ash or dust released into the atmosphere during an eruption shade shade sunlight and cause temporary cooling.
- volcanoes also release large amount of green house gases such as water vapor and carbon dioxide .Increased the amount of carbon dioxide in the atmosphere caused global warming.



Volcanic eruptions





Ocean currents

Ocean currents move warm and cold bodies of water around. Water has a specific heat capacity thousands of times that of air, and as results are able to chill or heat the air over them, as well as are the source of vapor that becomes clouds and precipitation.

Solar variation

The change in the amount of radiation emitted by the sun.



Earth orbital changes

- The earth orbit around the sun is an ellipse, not a circles but the ellipse change shape.
- Sometimes it is almost circular and the earth stays approximately the same distance from the sun as it progresses around its orbit.
- At other times the ellipse is more pronounced so that the earth moves closer and further away from the sun as it orbit.

Human causes (Man made causes)

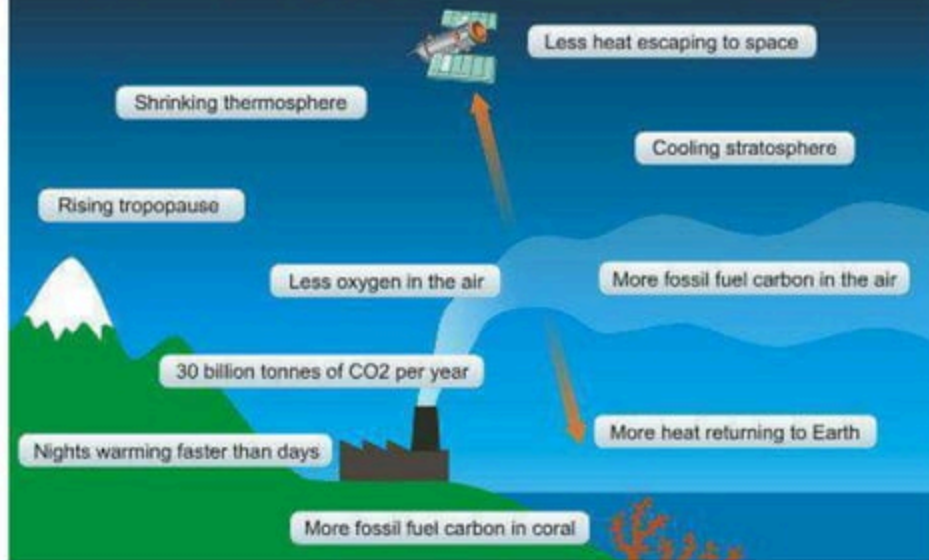


Green house gases

- Green house gases trap heat in the atmosphere which makes the earth warmer .
- Green house gases come from all sorts of everyday activities, such as using electricity ,heating our homes, and driving around town.



10 Indicators of a Human Fingerprint on Climate Change





Greenhouse Effects

- Many chemical compounds found in the earth's atmosphere act as "greenhouse gases".
 - **Main greenhouse gases** –
- Carbon dioxide
- Methane
- Nitrous oxides
- Fluorinated gases –hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride .
- Water vapor.

Major sources of Greenhouse gases



Sector	Activities	Gases
Energy	Forest fuel combustion Natural gas leakage Industrial activities Biomass burning	CO ₂ , CH ₄ , N ₂ O, O ₃
Forest	Harvesting Clearing Burning	CO ₂ , CH ₄ , N ₂ O,
Agriculture	Paddy fields Animal husbandry (ruminants) Fertilizer usage	CO ₂ , CH ₄ , N ₂ O

Major sources of Greenhouse gases



Sector	Activities	Gases
Waste management	Sanitary landfill Incineration Biomass decay	CO ₂ , CH ₄ , N ₂ O, O ₃ , CFCs
Industrial	Metal smelting & processing Cement production Petrochemical production Miscellaneous	CO ₂ , CH ₄ , N ₂ O, CFCs, SF ₆ , CF ₄ , C ₂ F ₆
(Source: Kemp, 2004)		



Deforestation

- Deforestation is when humans remove Or clear large areas of forest lands and related ecosystem for non-forest use.
- Deforestation is the largest sources of carbon dioxide emissions after fossil fuel burning , causing 15% of global greenhouse gas emissions.

Coal mining

- The environment impact of the coal industry include issues such as land use ,waste management ,water and air pollution caused by the coal mining .
- The combustion of coal is the largest contribution to the human made increase of carbon dioxide in the atmosphere.



Burning of fossil fuels

- The burning of fossil fuels produces around 21.3 billion tonnes of carbon dioxide per year ,but it is estimated that natural processes can only absorb about half of that amount .

Agriculture

- Agriculture is responsible for an estimated one third of climate change. It is generally agreed that about 25% of carbon dioxide emissions, are produced by agricultural sources ,mainly deforestation ,the use of fossil fuel based fertilizers, and the burning of biomass.



Effects of Climate Change

- **Global Temperature Rise** – As st global average surface air temperature has increased by around 1.8°F (1.0°C) globally during the last 115 years. *This change has been attributed largely to emissions of carbon dioxide and other emissions (NASA).*
- **Shrinking Ice Sheets** – Climate Change leading to global warming has led to shrinking of ice sheets. As per NASA, ice mass in Greenland and Antarctic ice sheets has decreased.



- **Glacial Retreat** – One of the adverse impacts of climate change is the retreat of glaciers across the globe i.e. in Himalayas, Alaska, Andes, Alps etc. It is claimed that Alaska glaciers have lost mass especially after 1984 where every subsequent year has shown ice mass lesser than the preceding year.
- **Decreased Snow Cover** – Satellite analysis has shown that snow cover has gradually decreased over the past five decades and that the snow is melting faster (NASA)
- **Ocean Acidification** – Oceans are sinks of carbon dioxide and have been absorbing excess heat caused by GHG **emissions**. More than quarter of the CO₂ emitted in the atmosphere is absorbed by the oceans leading of warming of ocean waters at almost all levels and acidification of the oceans which is detrimental to marine ecosystems (USGCRP, 2017).



- **Rise in Sea Level** – One of the most worrisome impacts of climate change and global warming is the increase in sea level. Global warming, melting glaciers, shrinking ice sheets have led to increase in sea level. It is projected that there has been an increase of 7-8 inches in global mean sea level since 1900.
- **Other Effects** – This apart, climate change has affected pattern of winds, pattern of precipitation and ocean circulation. This apart, oxygen concentrations at intermediate depths in oceans have shown a decline.

Impact on Human Beings



- **Flooding of Coastal Areas and Coastal Change** – Rising sea levels caused by melting of glaciers and polar ice sheets and further aggravated by increase in sea temperature at all levels is likely to cause subsidence i.e. sinking of land under sea.
- Rising sea level not only leads to subsidence but is also likely to enter freshwater resources and the entry of salt water is likely to contaminate freshwater resources causing serious issue of scarcity of water for human needs.
- The present scale of climate change may affect huge population of the world living in coastal cities. Further, climate change may lead to increase in precipitation further increasing chances of flooding and erosion of coastline thereby causing damage to life and property.
- **Risks to Health, Well Being and Productivity** – As stated above, climate change is likely to have huge impact on human beings. It will pose serious risk to human life, health and well being. Demographic change caused by Climate change may lead to overheating and related health issues leading to increase in heat related deaths. Overheating is likely to affect human productivity as well.



- **Shortages in Public Water Supply** – Increasing sea level, subsidence and intrusion of salt water in freshwater lakes coupled with increasing population will put more strains on available water resources. It is likely to cause shortage in water supply needed for various purposes thereby adversely affecting one and all. The problem will be more severe in coastal cities/states.
- **Effect on Food Production** – Extreme weather changes caused by climate change may affect food production adversely (UK Climate Change Risk Assessment, 2017). Further, the subsidence of low lying areas like Bangladesh having fertile plains may lead to scarcity of food stuffs
- Further, there will be emergence of new diseases and pests caused by climatic changes which can adversely affect humans, animals, plants and the environment.

Global warming



Slowly ,the ability of the earths atmosphere to absorb heat from the surface has increased and with it, the temperature of the atmosphere . This is known as global warming .



Causes of Global warming

- Fossil fuel burning power plant
- Burning gasoline for transportation
- Animal and Agriculture
- Deforestation
- Fertilizers

Pros and cons of global warming



Disadvantages

- Disruption of ocean circulation leads to unknown changes and effects in world climate.
- Increasing sea level causes flooding in low lying lands and evacuation
- In Mediterranean climatic regions such as Southern Europe, South Africa and Western Australia precipitation get reduced soil moisture levels decline and ultimately productivity goes down.
- Increase in desertification
- Abrupt weather changes affect the agriculture and results in food shortages
- Shortage of water in already water scarce areas.
- Starvation, malnutrition and increased deaths in the areas of food shortage
- More extreme weather and increased frequency of catastrophic events such as storms, typhoons and flooding events.
- Changes pollution and aeroallergen levels.



- Increase in epidemics diarrhea, cholera, dengue and malaria.
- Additional energy expenditure for cooling and excavation of ground water or bringing river water.
- Melting of permafrost leads to destruction of structures, landslides and avalanches.
- Increased air pollution.
- Permanent loss of glaciers and ice sheets.
- Cultural heritage sites get destroyed rapidly by increased extremes of weather pattern.
- Acidification of oceans.
- Earlier drying of forests leads to increased forest fires.
- Economical imbalance and increased violence.
- Increased allergy and asthma rates due to earlier blooming plants.
- Deaths may occur due to heat waves.
- Crop failure and pest out break.
- Extinction of plants and animals.
- Loss of plant and animal habitats.
- Emigration increases from poor or low lying countries to rich and wealthier nations.

Advantages



- Arctic, Antarctic, Siberia and other frozen regions of the earth experience more land for cultivation (opening of new lands) and more plant growth in favourable conditions.
- Northern Europe, Canada, Russia get benefited with increased harvest such as cereals, sugar beet, hay and potatoes.
- Less energy and fuel requirement for warming up.
- Decrease in death due to freezing.
- Longer the growing season could increase the agricultural production.

Mitigation approaches for Global warming



1. Energy:

- Increase energy efficiency in engines and boilers.
- Switching to low carbon fossil fuels such as natural gas.
- Introducing flue gas decarbonization and carbon sequestration.
- Increasing the use of nuclear energy.
- Increase the use of renewable energy sources.
- Conserve energy during the usage.

2. Industry:

- Reduce greenhouse gas emission such as methane.
- Reduce the material content of manufactured goods
- Switch to energy efficient technology.
- Transferring and sharing technology mainly from developed to developing countries.
- Recycle.



3. Transport:

- Improving energy efficiency of vehicles
- Reducing vehicle emission
- Reduce the vehicle weight and size to maximize the performance
- Changing land use patterns and life styles to reduce transport requirements
- Integrate transport policies
- Promote public transport option than personal vehicles
- Promote greener vehicles such as electric cars

4. Agriculture:

- Develop new management techniques to reduce tillage, recycling of crop residues, mixed cropping and avoid monoculture
- Restoration of wetlands
- Improve energy efficiency
- Improve nutrition of ruminants and reduce methane generation
- Reduce biomass burning
- Manage fertilizer use to reduce nitrous oxide production



5. Forestry


- Substitute burning of fuel wood for fossil fuels.
- Improve energy efficiency.
- Reduce biomass burning.
- Conserve CO₂ in living trees.
- Afforestation and reforestation.

6. Government

- Develop industrial land use plan to minimize energy consumption .
- Planning disposal of waste material to reduce production of methane and CO₂.
- Provide disincentives (tax) for excess energy consumption.
- Provide incentives for energy consumption and minimizing greenhouse gas emission such as reduce the taxes for electric and hybrid vehicles.
- Improve energy efficient, recycling and proper waste disposal.



References

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THANK YOU

