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Impact of Climate Change on the Environment

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Abstract

The Intergovernmental Panel on Climate Change (IPCC) has concluded that to avert catastrophic health impacts and prevent millions of climate change-related deaths, the world must limit temperature rise to 1.5°C. Past emissions have already made a certain level of global temperature rise and other changes to the climate inevitable. Global heating of even 1.5°C is not considered safe, however; every additional tenth of a degree of warming will take a serious toll on people's lives and health.

The effects of global warming can be seen and felt across the planet. Global warming, the gradual heating of Earth's surface, oceans and atmosphere, is caused by human activity, primarily the burning of fossil fuels that pump carbon dioxide (CO2), methane and other greenhouse gases into the atmosphere.Already, the consequences of global warming are measurable and visible."We can observe this happening in real time in many places," Josef Werne, a professor of geology and environmental science at the University of Pittsburgh, told Live Science. "Ice is melting in both polar ice caps and mountain glaciers. Lakes around the world, including Lake Superior, are warming rapidly — in some cases faster than the surrounding environment. Animals are changing migration patterns and plants are changing the dates of activity," such as trees budding their leaves earlier in the spring and dropping them later in the fall.Our economy also effected by climate change rapidly .

Key Words: Global warming, Climate Change, emissions,Gases,Environment and Carbon dioxide

Introduction

The Intergovernmental Panel on Climate Change (IPCC) has concluded that to avert catastrophic health impacts and prevent millions of climate change-related deaths, the world must limit temperature rise to 1.5°C. Past emissions have already made a certain level of global temperature rise and other changes to the climate inevitable. Global heating of even 1.5°C is not considered safe, however; every additional tenth of a degree of warming will take a serious toll on people's lives and health.

While no one is safe from these risks, the people whose health is being harmed first and worst by the climate crisis are the people who contribute least to its causes, and who are least able to protect themselves and their families against it - people in low-income and disadvantaged countries and communities.

The climate crisis threatens to undo the last fifty years of progress in development, global health, and poverty reduction, and to further widen existing health inequalities between and within populations. It severely jeopardizes the realization of universal health coverage (UHC) in various ways – including by compounding the existing burden of disease and by exacerbating existing barriers to accessing health services, often at the times when they are most needed. Over 930 million people - around 12% of the world's population - spend at least 10% of their household budget to pay for health care. With the poorest people largely uninsured, health shocks and stresses already currently push around 100 million people into poverty every year, with the impacts of climate change worsening this trend.[1]

Our health is closely linked to the environment we live in. However, our climate is changing, with significant consequences for our health, wellbeing and safety.

Climate change is a change in the world's weather systems that occurs over decades. Most of the recent changes in our climate have been brought about by human activity. Without intervention, the changing climate will have far-reaching and catastrophic consequences for our state, the country and the rest of the world. It is an urgent problem with implications at the global, national, community and personal level.[2]

Climate change is caused by increases in the amount of greenhouse gases (such as carbon dioxide, methane and nitrous oxide) in the atmosphere, which cause the earth's average temperature to rise.

Greenhouse gases trap heat in the atmosphere, raising air and sea temperatures. They are primarily produced through the burning of fossil fuels (like coal) for electricity generation, as well as through agricultural, mining, land management and transport practices.

The effects of climate change are already being felt. Because of global warming, Australia's climate has warmed on average by 1.4°C since official Bureau of Meteorology records began in 1910.[3]

One of the most immediate and obvious consequences of global warming is the increase in temperatures around the world. The average global temperature has increased by about 1.4 degrees Fahrenheit (0.8 degrees Celsius) over the past 100 years, according to the National Oceanic and Atmospheric Administration (NOAA).

Since record keeping began in 1895, the hottest year on record worldwide was 2016, according to NOAA and NASA data. That year Earth's surface temperature was 1.78 degrees F (0.99 degrees C) warmer than the average across the entire 20th century. Before 2016, 2015 was the warmest year on record, globally. And before 2015? Yep, 2014. In fact, all 10 of the warmest years on record have occurred since 2005, which tied with 2013 as the 10th-warmest year on record, according to NOAA's Global Climate Report 2021. Rounding out the top 6 hottest years on record across the globe are (in order of hottest to not as hot): 2020, 2019, 2015, 2017 and 2021.

For the contiguous United States and Alaska, 2016 was the second-warmest year on record and the 20th consecutive year that the annual average surface temperature exceeded the 122-year average since record keeping began, according to NOAA. Shattered heat records in the U.S. are increasingly becoming the norm: June 2021, for example, saw the warmest temperatures on record for that month for 15.2%of the contiguous U.S. That's the largest extent of record warm temperatures ever recorded in the country, according to the National Centers for Environmental Information.[4]

Climate change is impacting human lives and health during a sort of ways. It threatens the essential ingredients of excellent health - clean air, safe beverage, nutritious food supply, and safe shelter - and has the potential to undermine decades of progress in global health.
Between 2030 and 2050, global climate change is predicted to cause approximately 250 000 additional deaths per annum, from malnutrition, malaria, diarrhoea and warmth stress alone. The direct damage costs to health is estimated to be between USD 2-4 billion per annum by 2030.[5]

Causes of climate change

Fossil fuels – coal, oil and gas – are by far the largest contributor to global climate change, accounting for over 75 per cent of global greenhouse gas emissions and nearly 90 per cent of all carbon dioxide emissions.

As greenhouse gas emissions blanket the Earth, they trap the sun's heat. This leads to global warming and climate change. The world is now warming faster than at any point in recorded history. Warmer temperatures over time are changing weather patterns and disrupting the usual balance of nature. This poses many risks to human beings and all other forms of life on Earth.[6]

Generating power

Generating electricity and heat by burning fossil fuels causes a large chunk of global emissions. Most electricity is still generated by burning coal, oil, or gas, which produces carbon dioxide and nitrous oxide – powerful greenhouse gases that blanket the Earth and trap the sun's heat. Globally, a bit more than a quarter of electricity comes from wind, solar and other renewable sources which, as opposed to fossil fuels, emit little to no greenhouse gases or pollutants into the air.

Manufacturing goods

Manufacturing and industry produce emissions, mostly from burning fossil fuels to produce energy for making things like cement, iron, steel, electronics, plastics, clothes, and other goods. Mining and other industrial processes also release gases, as does the construction industry. Machines used in the manufacturing process often run on coal, oil, or gas; and some materials, like plastics, are made from chemicals sourced from fossil fuels. The manufacturing industry is one of the largest contributors to greenhouse gas emissions worldwide.

Cutting down forests

Cutting down forests to create farms or pastures, or for other reasons, causes emissions, since trees, when they are cut, release the carbon they have been storing. Each year approximately 12 million hectares of forest are destroyed. Since forests absorb carbon dioxide, destroying them also limits nature's ability to keep emissions out of the atmosphere. Deforestation, together with agriculture and other land use changes, is responsible for roughly a quarter of global greenhouse gas emissions.

Using transportation

Most cars, trucks, ships, and planes run on fossil fuels. That makes transportation a major contributor of greenhouse gases, especially carbon-dioxide emissions. Road vehicles account for the largest part, due to the combustion of petroleum-based products, like gasoline, in internal combustion engines. But emissions from ships and planes continue to grow. Transport accounts for nearly one quarter of global energy-related carbon-dioxide emissions. And trends point to a significant increase in energy use for transport over the coming years.

Producing food

Producing food causes emissions of carbon dioxide, methane, and other greenhouse gases in various ways, including through deforestation and clearing of land for agriculture and grazing, digestion by cows and sheep, the production and use of fertilizers and manure for growing crops, and the use of energy to run farm equipment or fishing boats, usually with fossil fuels. All this makes food production a major contributor to climate change. And greenhouse gas emissions also come from packaging and distributing food.

Powering buildings

Globally, residential and commercial buildings consume over half of all electricity. As they continue to draw on coal, oil, and natural gas for heating and cooling, they emit significant quantities of greenhouse gas emissions. Growing energy demand for heating and cooling, with rising air-conditioner ownership, as well as increased electricity consumption for lighting, appliances, and connected devices, has contributed to a rise in energy-related carbon-dioxide emissions from buildings in recent years.

Consuming too much

Our home and use of power, how we move around, what we eat and how much we throw away all contribute to greenhouse gas emissions. So does the consumption of goods such as clothing, electronics, and plastics. A large chunk of global greenhouse gas emissions are linked to private households. Our lifestyles have a profound impact on our planet. The wealthiest bear the greatest responsibility: the richest 1 per cent of

the global population combined account for more greenhouse gas emissions than the poorest 50 per cent.

Greenhouse gases'

'Greenhouse gases' are crucial to keeping our planet at a suitable temperature for life. Without the natural greenhouse effect, the heat emitted by the Earth would simply pass outwards from the Earth's surface into space and the Earth would have an average temperature of about -20°C.

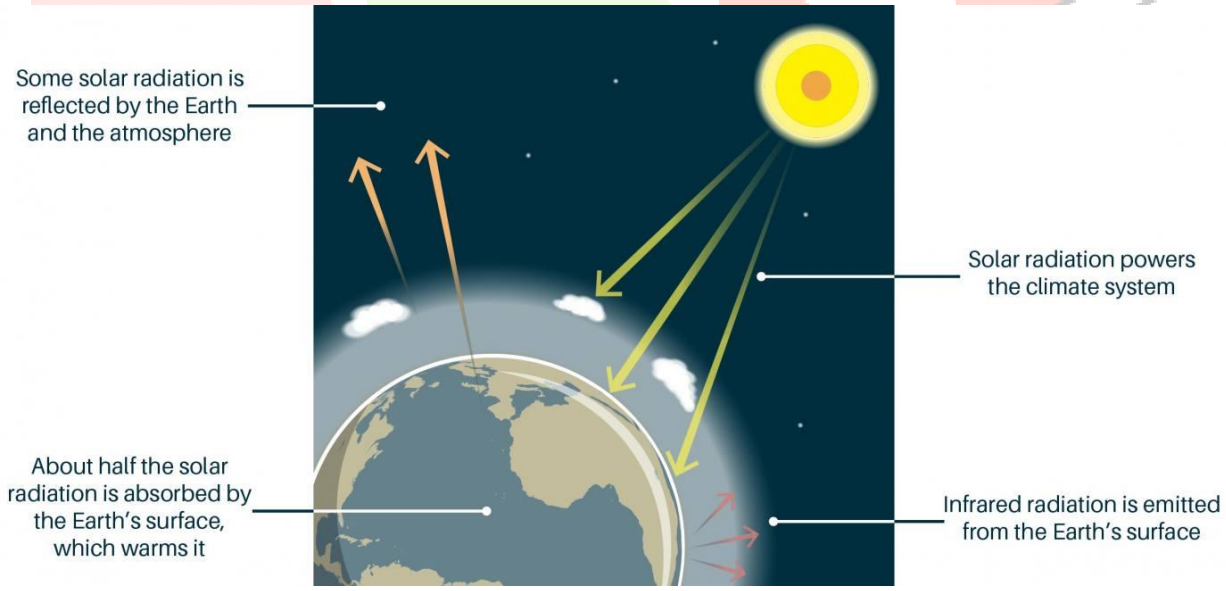

Fig : 1 Green House Effect

The greenhouse effect: some of the infrared radiation from the Sun passes through the atmosphere, but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth's surface and the lower atmosphere.

A greenhouse gas is called that because it absorbs infrared radiation from the Sun in the form of heat, which is circulated in the atmosphere and eventually lost to space. Greenhouse gases also increase the rate at which the atmosphere can absorb short-wave radiation from the Sun, but this has a much weaker effect on global temperatures.

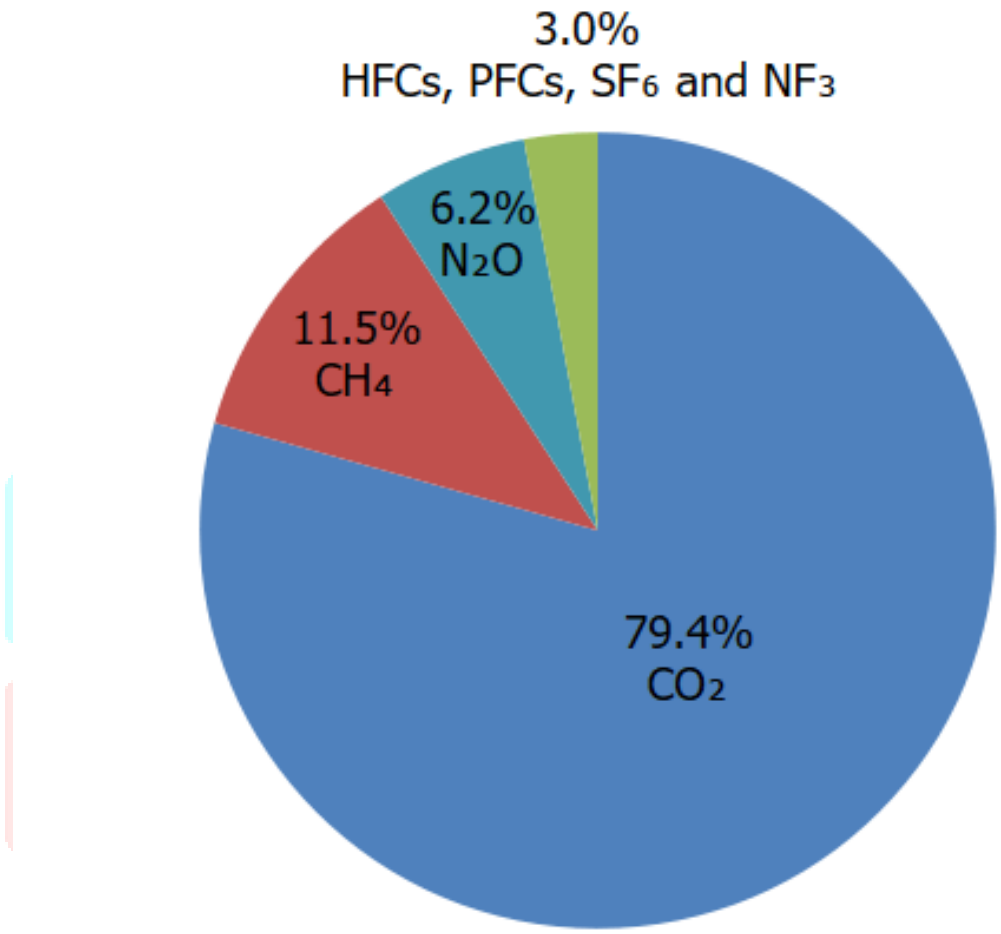

Fig : 2 Over view of Green House Gases

The CO2 released from the burning of fossil fuels is accumulating as an insulating blanket around the Earth, trapping more of the Sun's heat in our atmosphere. Actions carried out by humans are called anthropogenic actions; the anthropogenic release of CO2 contributes to the current enhanced greenhouse effect[7]

Which gases cause the greenhouse effect?

The contribution that a greenhouse gas makes to the greenhouse effect depends on how much heat it absorbs, how much it re-radiates and how much of it is in the atmosphere.

In descending order, the gases that contribute most to the Earth's greenhouse effect are:

- water vapour (H2O)
- carbon dioxide (CO2)
- nitrous oxide(N2O)
- methane (CH4)
- ozone (O3)

In terms of the amount of heat these gases can absorb and re-radiate (known as their global warming potential or GWP), CH4 is 23 times more effective and N2O is 296 times more effective than CO2. However, there is much more CO2 in the Earth's atmosphere than there is CH4 or N2O.

Not all the greenhouse gas that we emit to the atmosphere remains there indefinitely. For example, the amount of CO2 in the atmosphere and the amount of CO2 dissolved in surface waters of the oceans stay in equilibrium, because the air and water mix well at the sea surface. When we add more CO2 to the atmosphere, a proportion of it dissolves into the oceans.

Total U.S. Emissions in 2021 = 6,340 Million Metric Tons of CO_2 equivalent (excludes land sector). Percentages may not add up to 100% due to independent rounding. Land Use, Land-Use Change, and Forestry in the United States is a net sink and offsets 12% of these greenhouse gas emissions. This net sink is not shown in the above diagram. All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021.[8]*

- **Carbon dioxide (CO2)**: Carbon dioxide enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees and other biological materials, and also as a result of certain chemical reactions (e.g., cement production). Carbon dioxide is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.
- **Methane (CH4)**: Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, land use, and by the decay of organic waste in municipal solid waste landfills.
- **Nitrous oxide (N2O)**: Nitrous oxide is emitted during agricultural, land use, and industrial activities; combustion of fossil fuels and solid waste; as well as during treatment of wastewater.
- **Fluorinated gases**: Hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are synthetic, powerful greenhouse gases that are emitted from a variety of household, commercial, and industrial applications and processes. Fluorinated gases (especially hydrofluorocarbons) are sometimes used as substitutes for stratospheric ozone-depleting substances (e.g., chlorofluorocarbons, hydrochlorofluorocarbons, and halons). Fluorinated gases are typically emitted in smaller quantities than other greenhouse gases, but they are potent greenhouse gases. With global warming potentials

(GWPs) that typically range from thousands to tens of thousands, they are sometimes referred to as high-GWP gases because, for a given amount of mass, they trap substantially more heat than CO2.

Each gas's effect on climate change depends on three main factors:

It is estimated that between 1750 and 2019, atmospheric concentrations of carbon dioxide increased by 47 percent, methane by 156 percent, and nitrous oxide by 23 percent. In the late 1920s, we started adding man-made fluorinated gases like chlorofluorocarbons to the mix.

In recent decades, we've only picked up the pace. Of all the human-driven emissions of carbon dioxide, approximately half were generated in the last 30 years alone. And while global greenhouse gas emissions have occasionally plateaued or dropped from year to year (most recently at the start of the COVID-19 pandemic, as the pause in global travel and manufacturing dropped carbon dioxide emissions almost 6 percent), they're accelerating once again.

Carbon dioxide

Accounting for almost 80 percent of global human-caused emissions, carbon dioxide sticks around for quite a while. Once it's emitted into the atmosphere, 40 percent still remains after 100 years, 20 percent after 1,000 years, and 10 percent as long as 10,000 years later. (Carbon dioxide's lifetime cannot be represented with a single value because the gas is not destroyed over time, but instead moves among different parts of the ocean, atmosphere, and land. Some carbon dioxide is absorbed quickly, but some will remain in the atmosphere for thousands of years.)

Methane

Methane (CH4) persists in the atmosphere for around 12 years, which is less time than carbon dioxide, but it is much more potent in terms of the greenhouse effect. In fact, pound for pound, its global warming impact is almost 30 times greater than that of carbon dioxide over a 100-year period. In the United States, methane accounted for more than 12 percent of human-generated greenhouse gas emissions in 2021. While methane can come from natural sources like wetlands, more than half of all global methane emissions come from human activities like natural gas production and livestock-based agriculture.

Nitrous oxide

Nitrous oxide (N2O) is a powerful greenhouse gas: It has a GWP that is around 270 times that of carbon dioxide on a 100-year time scale, and it remains in the atmosphere, on average, a little more than a century. It accounts for about 6 percent of human-caused greenhouse gas emissions in the United States, from sources like the fertilizers used in agriculture.

Fluorinated gases

Emitted from a variety of manufacturing and industrial processes, fluorinated gases are man-made. There are four main categories: hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3).

Although fluorinated gases are emitted in smaller quantities than other greenhouse gases (they account for 3 percent of U.S. emissions), they trap substantially more heat. Indeed, the GWP for these gases can be in the thousands to tens of thousands, and they have long atmospheric lifetimes, in some cases lasting tens of thousands of years.

HFCs are used as a replacement for ozone-depleting chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), usually in air conditioners and refrigerators, but some are being phased out because of their high GWP. Replacing these HFCs and properly disposing of them is considered to be one of the most important climate actions the world can take.

Water vapor

The most abundant greenhouse gas overall, water vapor differs from other greenhouse gases in that changes in its atmospheric concentrations are linked not to human activities directly, but rather to the warming that *results* from the other greenhouse gases we emit. Warmer air holds more water. And since water vapor is a greenhouse gas, more water absorbs more heat, inducing even greater warming and perpetuating a positive feedback loop. (It's worth noting, however, that the net impact of this feedback loop is still uncertain, as increased water vapor also increases cloud cover that reflects the sun's energy away from the earth but holds heat in at night.)[9]

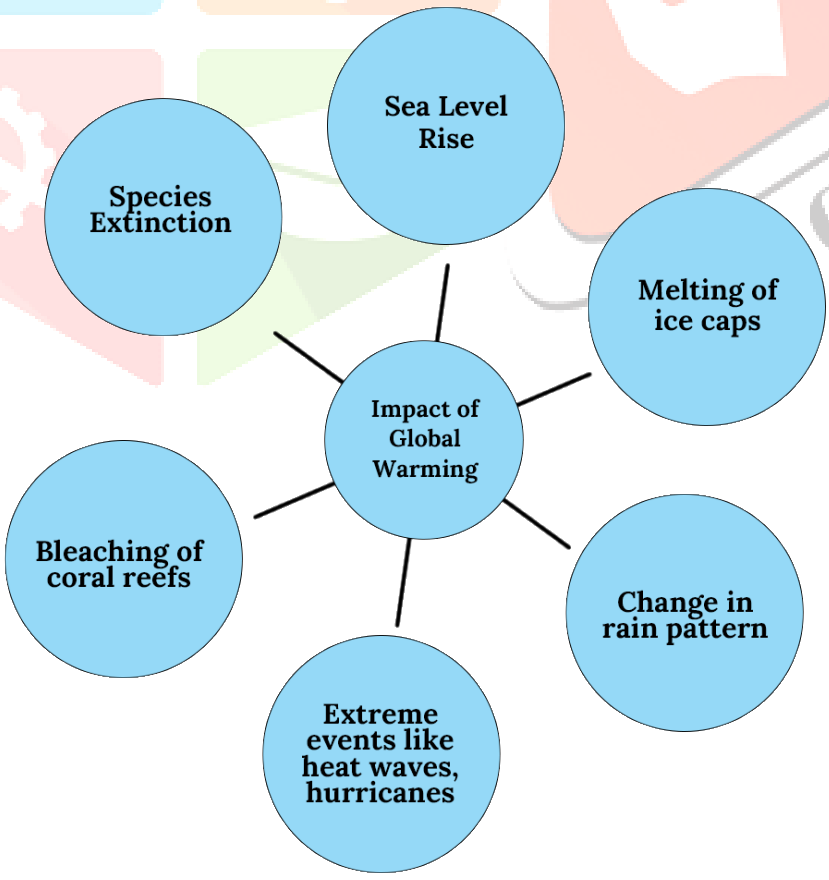

Fig : 3 Impact of Global Warming On The Environment

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.

Climate Change

Global warming has led to a change in climatic conditions. There are droughts at some places and floods at some. This climatic imbalance is the result of global warming.

Spread of Diseases

Global warming leads to a change in the patterns of heat and humidity. This has led to the movement of mosquitoes that carry and spread diseases.

High Mortality Rates

Due to an increase in floods, tsunamis and other natural calamities, the average death toll usually increases. Also, such events can bring about the spread of diseases that can hamper human life.

Loss of Natural Habitat

A global shift in the climate leads to the loss of habitats of several plants and animals. In this case, the animals need to migrate from their natural habitat and many of them even become extinct. This is yet another major impact of global warming on biodiversity.

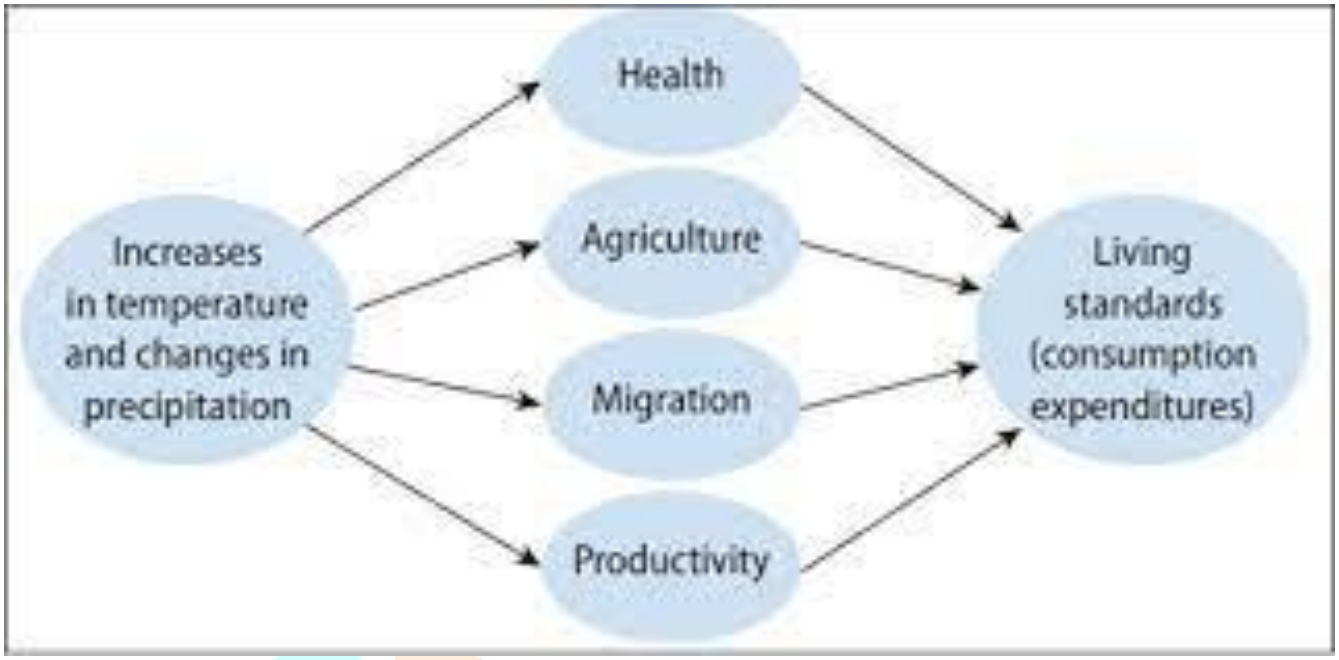

Fig :4 Effect of Climate change & Global Warming

What solutions to consider?

1.. Renewable energies
The first way to prevent climate change is to move away from fossil fuels. What are the alternatives? Renewable energies like solar, wind, biomass and geothermal.

2.. Energy & water efficiency
Producing clean energy is essential, but reducing our consumption of energy and water by using more efficient devices (e.g. LED light bulbs, innovative shower systems) is less costly and equally important.

3. Sustainable transportation
Promoting public transportation, carpooling, but also electric and **hydrogen mobility**, can definitely help reduce CO2 emissions and thus fight global warming.

4. Sustainable infrastructure
In order to reduce the CO2 emissions from buildings - caused by heating, air conditioning, hot water or lighting - it is necessary both to build new low energy buildings, and to renovate the existing constructions.

5. Sustainable agriculture & forest management
Encouraging better use of natural resources, stopping massive deforestation as well as **making agriculture greener** and more efficient should also be a priority.

6. Responsible consumption & recycling
Adopting responsible consumption habits is crucial, be it regarding food (particularly meat), clothing, cosmetics or cleaning products. Last but not least, recycling is an absolute necessity for dealing with waste.

7.Plant trees
Deforestation plays an important role in global warming and climatic changes. Planting trees is helpful as they absorb carbon dioxide from the atmosphere and regulate the climate. Hence, there is a dire need to plant more trees because a single tree can absorb one ton of CO2 in its lifetime.

8.Use less hot water
Do you know you can save 500 pounds of CO2 per year if you switch to cold showers and stop using hot water to wash clothes? Try installing energy-efficient geysers that consume less energy.

9.Spread awareness
Speak up about global warming, its consequences, causes and what steps we can take to prevent global warming with your friends, family and colleagues. Use the power of social media to voice out your concerns about climate change.

10.Save water
Make sure to turn off taps while brushing, go for shorter showers and do not waster water by cleaning your cars or bikes. By following these easy tips, all of us can play a significant role in reducing carbon dioxide emission and preventing global warming, thus, preserving the planet for future generations.[10]

Conclusion

The increase of temperatures and the climate upheavals disturb the ecosystems, modify the and cycles of plant reproduction. The scarcity of resources and climate change are changing life habits and migratory cycles of animals. We are already witnessing the disappearance of many species - including endemic species - or, conversely, the intrusion of invasive species that threaten crops and other animals.

Global warming therefore impacts biodiversity. It is the balance of biodiversity that is modified and threatened. According to the IPCC, a 1.5°C (34.7°F) average rise might put 20-30% of species at risk of extinction. If the planet warms by more than 2°C, most ecosystems will struggle.Climate change is the single biggest health threat facing humanity, and health professionals worldwide are already responding to the health harms caused by this unfolding crisis.
The Intergovernmental Panel on Climate Change (IPCC) has concluded that to avert catastrophic health impacts and prevent millions of climate change-related deaths, the world must limit temperature rise to 1.5°C. Past emissions have already made a certain level of global temperature rise and other changes to the climate inevitable. Global heating of even 1.5°C is not considered safe, however; every additional tenth of a degree of warming will take a serious toll on people's lives and health.
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