Climate Change and Global Warming

Frequently Asked Questions (FAQs)

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ENVIS Centre on Himalayan Ecology

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Q.1. What’s the difference between weather and climate?

Ans. Some people say “weather is what you get” and “climate is what you expect.” “Weather” refers to the more local changes in the climate we see around us, on short timescales from minutes to hours to days to weeks. Examples are familiar—rain, snow, clouds, winds, thunderstorms, heat waves and floods. “Climate” refers to longer-term averages (they may be regional or global), and can be thought of as the weather averaged over several seasons, years or decades. Climate change is harder for us to get a sense of because the timescales involved are much longer, and the impact of climate changes can be less immediate.

Q.2. Is climate change the same thing as global warming?

Ans. No. “Global warming” refers to an increase in the average temperature near the Earth’s surface. “Climate change” refers to the broader set of changes that go along with global warming, including changes in weather patterns, the oceans, ice and snow, and ecosystems. Most experts now use the term “climate change” because it gives a more complete picture of the changes that are happening around the world.

Q.3. What’s the difference between climate change and global warming?

Ans. “Global warming” refers to the long-term warming of the planet. Global temperature shows a well-documented rise since the early 20th century and most notably since the late 1970s. Worldwide, since 1880 the average surface temperature has gone up by about 0.8 °C (1.4 °F), relative to the mid-20th-century baseline (of 1951-1980). “Climate change” encompasses global warming, but refers to the broader range of changes that are happening to our planet. These include rising sea levels, shrinking mountain glaciers, accelerating ice melt in Greenland, Antarctica and the Arctic, and shifts in flower/plant blooming times. These are all consequences of the warming, which is caused mainly by people burning fossil fuels and putting out heat-trapping gases into the air. The terms “global warming” and “climate change” are sometimes used interchangeably, but strictly they refer to slightly different things.

Q.4. What are the most visible signs of climate change?

Ans. You can’t see the signs of climate change from one day to the next, but if you compare from year to year, the clues are everywhere! For example, as the Earth has become warmer, the average sea level around the world has risen by nearly 7 inches in the last 100 years, glaciers all over the world are shrinking, and many bird species are shifting northward. Some of the most obvious changes are happening in the Arctic, where the amount of ice in the ocean has decreased dramatically.

Q.5. Is the earth really getting hotter?

Ans. Yes. Although local temperatures fluctuate naturally, over the past 50 years the average global temperature has increased at the fastest rate in recorded history. And experts think the trend is accelerating: the 10 hottest years on record have all occurred.
since 1990. Scientists say that unless we curb global warming emissions, average U.S. temperatures could be 3 to 9 degrees higher by the end of the century\(^2\).

**Q.6. Is the sun causing global warming?**

**Ans.** No. The sun can influence the Earth’s climate, but it isn’t responsible for the warming trend we’ve seen over the past few decades. The sun is a giver of life; it helps keep the planet warm enough for us to survive. We know subtle changes in the Earth’s orbit around the sun are responsible for the comings and goings of the ice ages. But the warming we’ve seen over the last few decades is too rapid to be linked to changes in Earth’s orbit, and too large to be caused by solar activity. One of the “smoking guns” that tells us the sun is not causing global warming comes from looking at the amount of the sun’s energy that hits the top of the atmosphere. Since 1978, scientists have been tracking these using sensors on satellites and what they tell us is that there has been no upward trend in the amount of the sun’s energy reaching Earth\(^1\).

**Q.7. What is Ozone?**

**Ans:** Ozone, the triatomic form of oxygen (O\(_3\)), is a gaseous atmospheric constituent. In the troposphere, it is created by photochemical reactions involving gases resulting both from natural sources and from human activities (photochemical smog). In high concentrations, tropospheric ozone can be harmful to a wide range of living organisms. Tropospheric ozone acts as a greenhouse gas. In the stratosphere, ozone is created by the interaction between solar ultraviolet radiation and molecular oxygen (O\(_2\)). Stratospheric ozone plays a decisive role in the stratospheric radiative balance. Depletion of stratospheric ozone, due to chemical reactions that may be enhanced by climate change, results in an increased ground-level flux of ultraviolet (UV-) B radiation\(^6\).

**Q.8. What is the Ozone layer?**

**Ans.** The layer of ozone that begins approximately 15 km above Earth and thins to an almost negligible amount at about 50 km, shields the Earth from harmful ultraviolet radiation from the sun. The highest natural concentration of ozone (approximately 10 parts per million by volume) occurs in the stratosphere at approximately 25 km above Earth. The stratospheric ozone concentration changes throughout the year as stratospheric circulation changes with the seasons. Natural events such as volcanoes and solar flares can produce changes in ozone concentration, but man-made changes are of the greatest concern\(^6\).

**Q.9. Is the ozone hole causing climate change?**

**Ans.** Yes and no. The ozone hole is basically a man-made hole in the ozone layer above the South Pole during the Southern Hemisphere’s spring. The ozone layer, which lies high up in the atmosphere, shields us from harmful ultraviolet (UV) rays that come from the sun. Unfortunately we punched a hole in it, through the use of gases like chlorofluorocarbons (CFCs) in spray cans and refrigerants, which break down ozone molecules in the upper
atmosphere. While some of the sun’s UV rays slip through the hole, they account for less than one percent of the sun’s energy. So these UV rays cannot explain the global warming of the planet. What scientists have uncovered recently, however, is that the ozone hole has been affecting climate in the Southern Hemisphere. That’s because ozone is also a powerful greenhouse gas, and destroying it has made the stratosphere (the second layer of the atmosphere going upwards) over the Southern Hemisphere colder. The colder stratosphere has resulted in faster winds near the pole, which somewhat surprisingly can have impacts all the way to the equator, affecting tropical circulation and rainfall at lower latitudes. The ozone hole is not causing global warming, but it is affecting atmospheric circulation\textsuperscript{1}.

**Q.10. What is the greenhouse effect, and how does it affect the climate?**

Ans. The greenhouse effect is a natural process that helps make the Earth warm enough for us to live. It works like this: The Earth gets energy from the sun, heats up, and then gives off energy in a different form, called infrared radiation. Greenhouse gases in the atmosphere trap some of this energy before it escapes to outer space, warming the atmosphere. But people’s activities are adding extra greenhouse gases to the atmosphere, so the greenhouse effect is becoming stronger and the Earth is getting warmer\textsuperscript{3}.

**Q.11. Do Scientists agree on climate change?**

Ans. Yes, the vast majority of actively publishing climate scientists – 97 percent – agree that humans are causing global warming and climate change. Most of the leading science organizations around the world have issued public statements expressing this, including international and U.S. science academies, the United Nations Intergovernmental Panel on Climate Change and a whole host of reputable scientific bodies around the world. The number of peer-reviewed scientific papers that reject the consensus on human-caused global warming is a vanishingly small proportion of the published research. The small amount of dissent tends to come from a few vocal scientists who are not experts in the climate field or do not understand the scientific basis of long-term climate processes\textsuperscript{1}.

**Q.12. What is the evidence that proves the climate is changing?**

Ans. The global average temperature increased by more than 1.4°F over the last century. In fact, according to the National Oceanic and Atmospheric Administration (NOAA), the decade from 2000 to 2010 was the warmest on record, and 2010 was tied with 2005 as the warmest year on record. Rising global temperatures have also been accompanied by other changes in weather and climate. Many places have experienced changes in rainfall resulting in more intense rain, as well as more frequent and severe heat waves. The planet’s oceans and glaciers have also experienced changes: oceans are warming and becoming more acidic, ice caps are melting, and sea levels are rising. All of these changes are evidence that our world is getting warmer\textsuperscript{4}. 
Q.13. What is the greenhouse effect?

Ans. The greenhouse effect is the way in which heat is trapped close to the surface of the Earth by “greenhouse gases”. These heat-trapping gases can be thought of as a blanket wrapped around the Earth, which keeps it toastier than it would be without them. Greenhouse gases include carbon dioxide, methane and nitrous oxides. Greenhouse gases arise naturally, and are part of the make-up of our atmosphere. Earth is sometimes called the “Goldilocks” planet – it’s not too hot, not too cold, and the conditions are just right to allow life, including us, to flourish. Part of what makes Earth so amenable is the naturally-arising greenhouse effect, which keeps the planet at a friendly 15°C (59 °F) on average. But in the last century or so, humans have been interfering with the energy balance of the planet, mainly through the burning of fossil fuels that give off additional carbon dioxide into the air. The level of carbon dioxide in Earth’s atmosphere has been rising consistently for decades and traps extra heat near the surface of the Earth, causing temperatures to rise1.

Q.14. What are the Greenhouse Gases?

Ans. Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth’s surface, the atmosphere and clouds. This property causes the greenhouse effect. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), ozone (O3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6)7.

Q.15. How can the Earth be getting warmer if it’s colder than usual where I live?

Ans. The average temperature around the world is rising, and 2001–2010 was the warmest decade on record. But that doesn’t mean we won’t still have occasional cold spells. To see why, it’s helpful to understand the difference between weather and climate. “Weather” refers to day-to-day conditions, such as a rainstorm or today’s temperature. In contrast, “climate” refers to the average weather conditions you would expect to find in a certain place, based on patterns over many years. Day-to-day weather will always have its ups and downs, and there will always be a chance of extreme cold events. But as the Earth’s climate gets warmer over time, most places will experience more days with record high temperatures and fewer days with record low temperatures3.

Q.16. Is the hole in the ozone layer related to the climate change we are seeing today?

Ans. The ozone hole and climate change are essentially two separate issues. The “ozone hole” refers to the destruction of a layer of ozone molecules found high in Earth’s atmosphere. When healthy, this ozone layer helps to shield Earth from the sun’s harmful ultraviolet rays. The ozone layer has become thinner because of chemicals called chlorofluorocarbons that were once commonly used in products ranging from spray cans to
foam furniture cushions. A thinner ozone layer allows more ultraviolet rays to reach Earth, increasing the risk to humans from skin cancer, cataracts, and other health impacts. This, however, has only minor effects on climate change.

Q. 17. How can a change of one or two degrees in global average temperatures have an impact on our lives?

Ans. Changing the average global temperature by even a degree or two can lead to serious consequences around the globe. For about every 2°F of warming, we can expect to see
- 5—15% reductions in the yields of crops as currently grown
- 3—10% increases in the amount of rain falling during the heaviest precipitation events, which can increase flooding risks
- 5—10% decreases in stream flow in some river basins, including the Arkansas and the Rio Grande
- 200%—400% increases in the area burned by wildfire in parts of the western United States

Global average temperatures have increased more than 1.4 degrees Fahrenheit over the last 100 years. Many of the extreme precipitation and heat events that we have seen in recent years are consistent with what we would expect given this amount of warming. Scientists project that Earth’s average temperatures will rise between 2 and 12 degrees Fahrenheit by 2100.

Q.18. What do volcanoes have to do with climate change?

Ans. Overall, volcanoes release about 5 percent of the equivalent amount of CO2 released by humans. Quite small. However, about once every 20 years there is a volcanic eruption (e.g., Mount Pinatubo, El Chichon) that throws out a tremendous amount of particles and other gases. These will effectively shield us enough from the sun to lead to a period of global cooling. The particles and gases typically dissipate after about 2 years, but the effect is nearly global.

Q.19. What is a Carbon footprint?

Ans. The total amount of greenhouse gases that are emitted into the atmosphere each year by a person, family, building, organization, or company. A persons carbon footprint includes greenhouse gas emissions from fuel that an individual burns directly, such as by heating a home or riding in a car. It also includes greenhouse gases that come from producing the goods or services that the individual uses, including emissions from power plants that make electricity, factories that make products, and landfills where trash gets sent.

Q.20. What is Carbon Sequestration?

Ans. Carbon is found in all living organisms and is the major building block for life on Earth. Carbon exists in many forms, predominately as plant biomass, soil organic matter, and as the gas carbon dioxide (CO2) in the atmosphere and dissolved in seawater. Carbon sequestration is the long term storage of carbon in oceans, soils, vegetation (especially forests), and geologic formations. Although oceans store most of the Earth’s carbon, soils
contain approximately 75% of the carbon pool on land — three times more than the amount stored in living plants and animals. Therefore, soils play a major role in maintaining a balanced global carbon cycle.

Q.21. How is Carbon Sequestered in Soils?

Ans. Through the process of photosynthesis, plants assimilate carbon and return some of it to the atmosphere through respiration. The carbon that remains as plant tissue is then consumed by animals or added to the soil as litter when plants die and decompose. The primary way that carbon is stored in the soil is as soil organic matter (SOM). SOM is a complex mixture of carbon compounds, consisting of decomposing plant and animal tissue, microbes (protozoa, nematodes, fungi, and bacteria), and carbon associated with soil minerals. Carbon can remain stored in soils for millennia, or be quickly released back into the atmosphere. Climatic conditions, natural vegetation, soil texture, and drainage all affect the amount and length of time carbon is stored.

Q.22. What is the IPCC?

The Intergovernmental Panel on Climate Change (IPCC) was established jointly by the United Nations Environment Programme and the World Meteorological Organization in 1988. The purpose of the IPCC is to assess information in the scientific and technical literature related to all significant components of the issue of climate change. The IPCC draws upon hundreds of the world’s expert scientists as authors and thousands as expert reviewers. Leading experts on climate change and environmental, social, and economic sciences from some 60 nations have helped the IPCC to prepare periodic assessments of the scientific underpinnings for understanding global climate change and its consequences. With its capacity for reporting on climate change, its consequences, and the viability of adaptation and mitigation measures, the IPCC is also looked to as the official advisory body to the world’s governments on the state of the science of the climate change issue. For example, the IPCC organized the development of internationally accepted methods for conducting national greenhouse gas emission inventories.

Q.23. What is Kyoto protocol?

Ans. The Kyoto Protocol to the UNFCCC was adopted at the Third Session of the Conference of the Parties (COP) in 1997 in Kyoto. It contains legally binding commitments, in addition to those included in the FCCC. Annex B countries agreed to reduce their anthropogenic GHG emissions (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) by at least 5% below 1990 levels in the commitment period 2008-2012. The Kyoto Protocol came into force on 16 February 2005.

Q.24. What is Montreal Protocol?

The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in Montreal in 1987, and subsequently adjusted and amended in London (1990), Copenhagen (1992), Vienna (1995), Montreal (1997) and Beijing (1999). It controls the consumption and
production of chlorine- and bromine containing chemicals that destroy stratospheric ozone, such as CFCs, methyl chloroform, carbon tetrachloride, and many others.\(^7\)

**Q. 25. Can climate change harm plants and animals?**

**Ans.** Yes. Any change in the climate of an area can affect the plants and animals that live there. Some animals might adapt or move elsewhere, but others could have trouble surviving. For example, if the ice in the Arctic Ocean disappears, the animals that depend on this ice won't have anywhere else to go. Climate change also alters plants’ and animals’ life cycles. For example, some flowers are blooming earlier in the spring, while some animals are migrating at different times.\(^3\)

**Q. 26. Is it too late to do anything about climate change?**

**Ans.** It is not too late to have a significant impact on future climate change and its effects on us. With appropriate actions by governments, communities, individuals, and businesses, we can reduce the amount of greenhouse gas pollution we release and lower the risk of much greater warming and severe consequences. Many of the actions that we can take to address climate change will have other benefits, such as cleaner, healthier air. In addition, communities can take action to prepare for the changes we know are coming.\(^4\)

**Q. 27. What can we do to stop climate change?**

**Ans.** There are lots of things you, your friends, and your family can do each day to reduce greenhouse gas emissions. A major way that greenhouse gases get into the atmosphere is when people burn coal, oil, and natural gas for energy. Here are some simple steps you can take to use less energy:

- Turn off the lights when you leave a room.
- Turn off your computer and other electronic devices when you’re not using them.
- Drive less. Instead, walk, ride your bike, or use public transportation if you can.
- Use less water.
- Create less waste.
- Recycle used paper, cans, bottles, and other materials.\(^3\)

**Q. 28. What can I do to help fight global warming?**

**Ans.** There are many simple steps you can take right now to cut global warming pollution. Make conserving energy a part of your daily routine. Each time you choose a compact fluorescent light bulb over an incandescent bulb, for example, you'll lower your energy bill and keep nearly 700 pounds of carbon dioxide out of the air over the bulb’s lifetime. By opting for a refrigerator with the Energy Star label -- indicating it uses at least 15 percent less energy than the federal requirement over a less energy-efficient model, you can reduce carbon dioxide pollution by nearly a ton in total.\(^2\)
Q.29. What is Glacier?
Ans. A mass of land ice flowing downhill (by internal deformation and sliding at the base) and constrained by the surrounding topography (e.g., the sides of a valley or surrounding peaks); the bedrock topography is the major influence on the dynamics and surface slope of a glacier. A glacier is maintained by accumulation of snow at high altitudes, balanced by melting at low altitudes or discharge into the sea. Glacier ice is the largest reservoir of fresh water on Earth, and second only to the oceans as the largest reservoir of total water. Glaciers are found on every continent except Australia⁷.

Sources and further information:
¹http://climate.nasa.gov/faq/
²http://www.nrdc.org/globalwarming/f101.asp
³http://www3.epa.gov/climatechange/kids/faq.html
⁴http://www3.epa.gov/climatechange/basics/facts.html
⁵http://www.esa.org
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