

ENVIRONMENTAL CHANGES: Global Warming, Climate Change and Impacts.

Definitions

Human Impact on Climate Change

Economic Impacts from Climate Change

National Security Impacts from Climate Change

Let's start with understanding the terminology. Global warming and climate change are closely related phenomena that have significant impacts on our planet's environmental systems. It is important to note that while the terms "global warming" and "climate change" are often used interchangeably, they have distinct meanings. Global warming specifically refers to the increase in Earth's average temperature, while climate change encompasses a broader range of environmental changes resulting from this warming trend.

Global Warming - Focuses on the increase in temperature due to green house gases.

Climate Change - Includes global warming and its wider impacts on weather, ecosystems, and sea levels.

In short:

Global warming refers to the long-term increase in Earth's average surface temperature due to rising levels of greenhouse gases (GHGs) in the atmosphere, primarily from human activities like burning fossil fuels, deforestation, and industrial processes. These gases trap heat from the sun, creating a "greenhouse effect."

Climate change encompasses global warming but also includes the broader changes in climate patterns that result from this warming. These changes can manifest as altered precipitation patterns, more frequent and severe weather events (like hurricanes and droughts), rising sea levels, and shifts in ecosystems and wildlife habitats.

Both pose significant challenges to natural and human systems, requiring urgent action to mitigate their effects.

A bit longer:

Global warming and climate change are closely related phenomena that have significant impacts on our planet's environmental systems. Global warming refers to the long-term

increase in Earth's average surface temperature, primarily due to human activities since the Industrial Revolution. This warming is mainly caused by the release of greenhouse gases, especially carbon dioxide (CO₂), into the atmosphere through the burning of fossil fuels, industrial processes, and deforestation. Since 1880, the global annual temperature has risen by more than 1 degree Celsius (about 2 degrees Fahrenheit), with the rate of increase more than doubling since 1981. Climate change, on the other hand, is a broader term that encompasses global warming and refers to long-term shifts in weather patterns and climate systems. While global warming specifically focuses on temperature increases, climate change includes a wide range of observed effects, such as:

- Rising sea levels
- Melting ice sheets and glaciers
- Changes in precipitation patterns
- Increased frequency and severity of extreme weather events
- Alterations in ecosystems and biodiversity

Climate change is primarily driven by human activities, particularly the emission of greenhouse gases, which trap heat in the atmosphere and cause the Earth's surface temperature to rise. However, natural processes can also contribute to climate change, including internal variability (e.g., El Niño and La Niña cycles) and external forcings (e.g., volcanic activity and changes in solar output). The impacts of global warming and climate change are already being felt worldwide and are expected to worsen if significant action is not taken to reduce greenhouse gas emissions. Some of the consequences include:

- More frequent and intense heatwaves, droughts, and wildfires
- Stronger hurricanes and tropical storms
- Disruptions to agriculture and food security
- Loss of biodiversity and ecosystem changes
- Increased health risks due to air pollution and the spread of infectious diseases

The Global consensus on addressing the threat:

To address these challenges, there is a global consensus that temperature increases need to be kept well below 2°C above pre-industrial levels, with an ambitious goal of limiting the rise to 1.5°C. This requires immediate and substantial reductions in greenhouse gas

emissions through the transition to renewable energy sources, improved energy efficiency, and sustainable land use practices.

[Global Warming 101 - Definition, Facts, Causes and Effects of Global Warming \(nrdc.org\)](#)

[What Is Climate Change? - NASA Science](#)

[What Is Climate Change? | United Nations](#)

[What are climate change and global warming? | WWF](#)

Human Impact on Climate Change:

Yes, humans significantly impact climate change. Human activities contribute significantly to climate change by increasing the concentrations of greenhouse gases and aerosols in the atmosphere, which alter Earth's energy balance.

Here are the primary ways in which human activities drive climate change:

Greenhouse Gas Emissions

- **Burning Fossil Fuels:** Activities like driving cars, generating electricity, and industrial processes release large amounts of carbon dioxide (CO₂), the most significant greenhouse gas and other greenhouse gases (GHGs) into the atmosphere. The combustion of coal, oil, and natural gas for energy and transportation releases large amounts of carbon dioxide (CO₂). This activity is the primary driver of increased atmospheric CO₂ levels since the Industrial Revolution.
- **Agriculture:** Farming practices, especially livestock production, emit methane and nitrous oxide, potent GHGs that contribute to climate change. Agricultural practices contribute to the emission of methane (CH₄) and nitrous oxide (N₂O). Methane is released from livestock digestion and manure management, while nitrous oxide is emitted from soil management practices, including the use of synthetic fertilizers.
- **Deforestation:** Cutting down forests reduces the number of trees that can absorb CO₂, increasing atmospheric GHG levels. Additionally, the process of deforestation itself releases CO₂ stored in trees.
- **Industrial Processes:** Manufacturing and chemical production can release various GHGs, including fluorinated gases. Certain industrial activities, such as cement production, also release significant amounts of CO₂. Other industrial processes

emit various greenhouse gases, including halocarbons, which have a high global warming potential.

- **Waste Management:** Landfills produce methane as organic waste decomposes, adding to greenhouse gas emissions.

Aerosols and Cloudiness

Human activities release aerosols (small particles) into the atmosphere, which can affect climate in multiple ways:

Direct Effects: Aerosols can reflect sunlight back into space, leading to a cooling effect. However, some aerosols, such as black carbon, can absorb sunlight and contribute to warming.

Indirect Effects: Aerosols can alter cloud properties, affecting their reflectivity and lifespan, which in turn influences Earth's energy balance. Overall, aerosols tend to have a net cooling effect, but their impact is complex and varies by type and location.

Changes in Land Use

Human activities have altered land cover, including converting forests to croplands and urban areas. These changes affect the reflectivity (albedo) of Earth's surface, which can influence local and global climate patterns. For instance, urban areas often create "heat islands" that are warmer than surrounding rural areas.

Overall, the cumulative effect of these human activities has been a significant warming influence on the climate system, far exceeding the impact of natural processes such as volcanic eruptions and variations in solar radiation. This anthropogenic influence is the primary driver behind the observed changes in global climate patterns over the past century. These human activities disrupt the natural balance of greenhouse gases, leading to global warming and subsequent climate changes, such as extreme weather events and rising sea levels. Addressing these impacts is crucial for mitigating climate change.

[howhuman.pdf \(lehigh.edu\)](#)

[The 7 human activities that cause climate change \(concernusa.org\)](#)

[Are humans causing or contributing to global warming? | NOAA Climate.gov](#)

[Causes of Climate Change | US EPA](#)

[Climate Change 2021: The Physical Science Basis | Climate Change 2021: The Physical Science Basis \(ipcc.ch\)](#)

[Global Forest Resources Assessments | Food and Agriculture Organization of the United Nations \(fao.org\)](#)

Economic Impacts of Climate Change on U.S. Economy

Climate change significantly impacts the U.S. economy in various ways, including damage to infrastructure, increased health care costs, agricultural losses, and changes in labor productivity.

- **Overall Economic Impact:** Climate change is projected to harm the U.S. economy, even with modest amounts of warming. The U.S. economy could lose between 1% to 4% of GDP annually by the end of the century under a high emissions scenario, considering effects on mortality, labor, and the energy sector alone.
- **Extreme Weather Events:** The cost of climate and weather disasters in the United States totaled more than \$165 billion in 2022, the third most costly year on record. These events, including hurricanes, wildfires, and floods, are becoming more frequent and severe due to climate change, causing significant economic losses.
- **Infrastructure Damage:** Transportation and energy infrastructure are at risk of damage from extreme weather events, potentially disrupting supply chains and economic activity.
- **Increased Health Care Costs:** Rising temperatures and changing climates contribute to health issues, including heat-related illnesses and respiratory problems, which increase health care expenditures.
- **Agricultural Losses:** Climate change affects crop yields and livestock productivity due to altered rainfall patterns, pests, and extreme temperatures, threatening food security and farmer incomes. This sector is particularly vulnerable to climate risk. Extreme rainfall events have increased 37% in the Midwest since the 1950s, causing significant crop losses and economic damage.
- **Labor Productivity:** Higher temperatures can reduce worker productivity, especially in outdoor industries like agriculture and construction, leading to economic losses.
- **Insurance and Property Values:** Increased frequency of natural disasters leads to higher insurance premiums and can devalue properties in high-risk areas, affecting overall economic stability.
- **Housing:** Nearly one-third of the U.S. housing stock could be at high risk of climate-change-induced hazards.
- **Regional Disparities:** The poorest third of counties in the United States are projected to experience damages costing between 2% and 20% of county income under a high emissions scenario, substantially widening the income gap between rich and poor parts of the country.

- **Productivity and Investment:** Climate change could negatively impact productivity and business investment. Rising temperatures and heat waves could result in lower output per worker, while the risk of damage to physical capital from extreme weather events could decrease businesses' incentive to invest.
- **Long-term Economic Growth:** Climate change is expected to affect key determinants of long-term economic growth, such as productivity and business investment, potentially leading to slower economic growth over time.
- **Adaptation Costs:** The need to adapt to climate change impacts will require significant investments in infrastructure, technology, and other measures, which will have both costs and potential economic benefits.

The overall impact on the U.S. economy is expected to be negative and increasingly adverse over time. The extent of these impacts will depend on the level of global warming and the effectiveness of mitigation and adaptation efforts.

[The Importance of Measuring the Fiscal and Economic Costs of Climate Change | OMB | The White House](#)
[Climate Change and the U.S. Economic Future | EPIC \(uchicago.edu\)](#)
[How Climate Change Impacts the Economy – State of the Planet \(columbia.edu\)](#)
[Home | FEMA.gov](#)
[National Oceanic and Atmospheric Administration \(noaa.gov\)](#)

National Security Impacts of Climate Change

Climate change poses significant national security risks for the United States, affecting military readiness, geopolitical stability, resource availability, and disaster response capabilities.

Military Readiness: Extreme weather events can damage military infrastructure and disrupt training exercises, impacting readiness and operational capabilities. Sea-level rise and extreme weather are damaging coastal military installations. For example, the Norfolk Naval Station in Virginia experiences regular flooding, impacting operations. Extreme weather disrupts training exercises, affects equipment maintenance, and can limit available training areas. Global supply chains for critical military technologies are vulnerable to climate-related disruptions.

Geopolitical Instability: Climate change can exacerbate resource scarcity, leading to conflicts over water and food, especially in vulnerable regions. This can destabilize nations and create refugee crises. Climate change acts as a "threat multiplier," exacerbating existing environmental stresses and security risks. It contributes to food and water insecurity, poverty, social inequality, and political instability in vulnerable regions. These

factors can increase the risk of violence and conflict, potentially requiring U.S. military intervention.

Displacement and migration: Climate-induced displacement may lead to increased migration, potentially causing regional instability.

Resource Competition: As natural resources like freshwater become scarcer due to climate change, competition for these resources may increase, leading to conflicts that threaten U.S. interests abroad. Changing climate patterns may intensify competition over critical resources, including water and arable land.

Disaster Response Challenges: Increased frequency of natural disasters strains federal and state resources, complicating disaster response and recovery efforts. The military is called upon more frequently for disaster relief and humanitarian assistance due to climate-related events. For instance, National Guard deployments for wildfire response increased significantly between 2016 and 2021.

Health Risks to Personnel: Climate change impacts health, increasing the risk of heat-related illnesses and other health issues among military personnel, which can affect deployment and readiness. Climate change can increase the spread of diseases, posing risks to both military personnel and civilian populations.

Economic impacts: Climate-related disruptions to global supply chains and critical industries can have cascading effects on national security.

The challenges and threats are assessed by the various governmental entities across fields from military to agricultural and health. The U.S. Department of Defense and other government agencies are working to integrate climate risk assessments into their planning and operations. This includes efforts to improve the resilience of military infrastructure, adapt to changing environmental conditions, and prepare for potential climate-related conflicts and humanitarian crises.

But to prepare for these changes and threats requires agencies to be allowed to acknowledge, measure, and act upon the assessment. On a truly basic level, the agency must continue to exist.

The ever-enduring claim of climate change being a hoax impacts the ability to plan, prepare and act. Every policy change eliminating “Climate Change” references and studies by governmental agencies severely impacts U.S. National Security. Every plan or proposal to remove expertise from the various agencies and to eliminate the agencies themselves severely impacts U.S. National Security.

[The Center for Climate & Security « Exploring The Security Risks of Climate Change \(climateandsecurity.org\)](https://climateandsecurity.org/)

[Department of the Navy Releases Climate Action 2030 > United States Navy > display-pressreleases](#)

[Climate Change: A Climate Migration Pilot Program Could Enhance the Nation's Resilience and Reduce Federal Fiscal Exposure | U.S. GAO](#)

[Climate Change Impacts on National Security \(nrcm.org\)](#)

[Why Climate Change Is a National Security Risk – State of the Planet \(columbia.edu\)](#)

[National Security Snapshot: Climate Change Risks to National Security | U.S. GAO](#)