

The Increase in Global Temperatures: Causes, Consequences, and Current Realities

The increase in global temperatures is one of the most severe and noticeable manifestations of climate change. Since the Industrial Revolution, human activity has profoundly altered the composition of the atmosphere, raising greenhouse gas concentrations and triggering a gradual but sustained rise in the planet's average temperature. The consequences of this phenomenon are already evident in all regions of the world, with extreme weather events, glacier melting, rising sea levels, and ecosystem disruptions.

The temperature rise has not occurred evenly across the planet. Some areas, such as the Arctic, are warming more rapidly, leading to faster ice loss, which in turn accelerates sea level rise and disrupts the delicate balance of marine ecosystems. Changes in atmospheric and oceanic patterns have intensified the frequency and severity of extreme weather, including hurricanes, droughts, and heatwaves. These events are devastating to communities, particularly in poorer regions where infrastructure is less able to withstand such shocks.

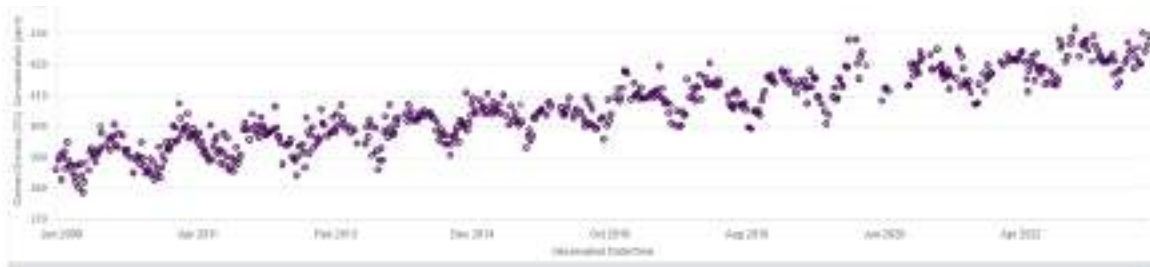
This isn't a distant problem; the impacts of rising temperatures are happening right now. Across the world, communities are experiencing the consequences, from farmers facing droughts that threaten food security, to people losing their homes to floods, and even entire islands being threatened by rising seas. This leads to displacement, forcing populations to migrate in search of safer living conditions, contributing to what are now being termed as "climate refugees."

By understanding the causes and effects of global warming, we can take steps to reduce its impact and protect our planet for future generations. Governments, organizations, and individuals are increasingly adopting measures such as transitioning to renewable energy, improving energy efficiency, and restoring forests that act as carbon sinks. However, significant efforts are still needed to meet the targets of international agreements like the Paris Agreement, which aims to limit the global temperature rise to below 2°C above pre-industrial levels.

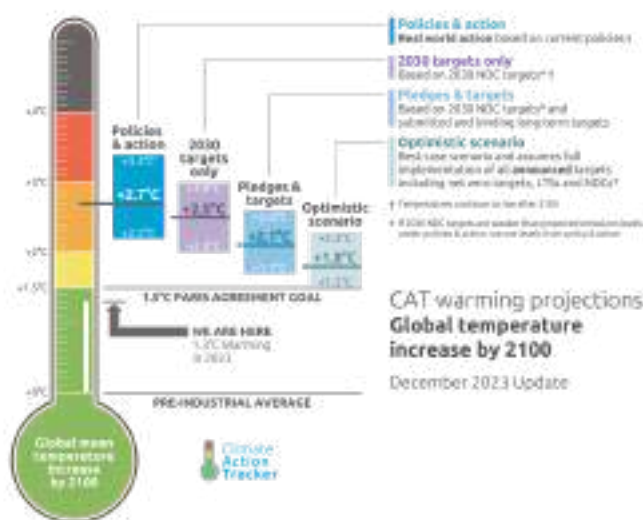
We can explore the causes of rising temperatures, their global and local consequences, and specific examples to illustrate how global warming is affecting various regions of the world. The explanation will include scientific data and local testimonies that demonstrate how rising temperatures are transforming the environmental, social, and economic reality of entire communities. From the retreat of glaciers in the Andes affecting water supplies to the coral bleaching in the Great Barrier Reef disrupting marine biodiversity, the evidence of global warming's effects is unmistakable. Moreover, economic impacts such as reduced agricultural yields, increased costs for disaster recovery, and strained public health systems are adding layers of complexity to the crisis. Climate change is not just an environmental issue but a global challenge that touches every aspect of life.

Do you want to know more? Feel free to ask questions.

show image: carbon_emissions_spain.png which is a graphic for rising mean carbon dioxide concentration from 2009 to 2024



show image: rising_temperatures_infographic.png which is an infographic image for the CAT warming projections on temperature increase by 2100, which covers optimistic scenarios, 2030 targets and the effects of paris 2030 pledges overtime if they are met.



Did You Know?

- Global Warming Speed:** The Earth's average surface temperature has risen about 1.1°C since the late 19th century, a change driven primarily by increased carbon dioxide and other human-made emissions into the atmosphere (<https://climate.nasa.gov/evidence/>).
- Record-Breaking Carbon Levels:** The concentration of CO₂ in the atmosphere reached 420 parts per million (ppm) in 2022, the highest level in 800,000 years (<https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide>).
- Heatwaves Becoming the Norm:** In 2022, Europe experienced temperatures exceeding 40°C, breaking long-standing records. In the UK, temperatures hit 40.3°C for the first time in history (<https://www.metoffice.gov.uk/about-us/press-office/news/weather-and-climate/2022/40c-new-uk-record>).

- **Rising Sea Levels:** Since 1880, the global average sea level has risen by about 24 centimeters (9 inches), primarily due to thermal expansion (as water warms, it expands) and melting glaciers
(<https://www.ipcc.ch/srocc/chapter/chapter-4-sea-level-rise-and-implications-for-low-lying-islands-coasts-and-communities/>).
 - **Melting Ice Sheets:** Greenland's ice sheet lost a massive 8.5 billion tons of ice in just one day during a 2021 heatwave, contributing significantly to global sea-level rise
(<https://climate.nasa.gov/news/3096/melting-of-greenlands-ice-sheet-passes-the-point-of-no-return/>).
 - **Disappearing Arctic Ice:** The Arctic is warming nearly twice as fast as the rest of the planet. If current trends continue, the Arctic could be ice-free during summer by 2040
[The Arctic is warming twice as fast as the rest of the world, according to NOAA report - ABC News \(go.com\)](https://www.noaa.gov/news/the-arctic-is-warming-twice-as-fast-as-the-rest-of-the-world-according-to-noaa-report-abc-news-go-com)
 - **Fastest Warming Decade:** The last decade (2011-2020) was the warmest on record. In fact, 2020 tied with 2016 as the hottest year ever recorded globally
(<https://www.nasa.gov/press-release/2020-tied-for-warmest-year-on-record-nasa-analysis-shows>).
 - **Ocean Warming:** The world's oceans absorb about 90% of the excess heat from global warming. Since 1969, the top 700 meters of ocean water have warmed by more than 0.33°C
(<https://www.climate.gov/news-features/understanding-climate/climate-change-ocean-heat-content>).
 - **Increasing Hot Days:** The number of hot days (where temperatures exceed 35°C) has doubled globally since 1980. By 2050, this number could triple if current trends continue
(<https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>).
 - **Deadly Heatwaves:** In 2021, the Pacific Northwest heatwave broke records with temperatures reaching 49.6°C in Lytton, Canada, making it the highest temperature ever recorded in the country
(<https://www.bbc.com/news/world-us-canada-57654133>).
 - **Nighttime Heat Rising Faster:** Nighttime temperatures are rising faster than daytime temperatures due to increased humidity trapping heat, leading to more "tropical nights" where temperatures do not fall below 20°C
(<https://www.nature.com/articles/nclimate2658>).
 - **Frequency of Heatwaves:** Heatwaves that used to occur once every 50 years now happen once every decade. By 2100, they could happen almost annually in many parts of the world (<https://www.ipcc.ch/sr15/chapter/chapter-3/>).
 - **Warmest Years on Record:** Since 2000, 19 of the 20 warmest years on record have occurred, a clear signal of the accelerating impact of climate change
(<https://climate.nasa.gov/vital-signs/global-temperature/>).
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1. Causes of the Increase in Global Temperatures

1.1. The Intensified Greenhouse Effect

Global warming is the direct result of increasing greenhouse gases in the atmosphere, mainly CO₂, methane (CH₄), and nitrogen oxides (NO_x). The greenhouse effect is a natural phenomenon that allows life on Earth to thrive by retaining some of the sun's heat. However, human activity has intensified this process, altering Earth's energy balance.

The concentration of carbon dioxide in the atmosphere reached 420 parts per million (ppm) in 2022, the highest level in the last 800,000 years (<https://www.climate.gov/news-features/understanding-climate/climate-change-atmospheric-carbon-dioxide>). This increase comes from activities such as burning fossil fuels, deforestation, and intensive agricultural practices.

Maldives Example

One of the countries that has directly experienced the rise in sea levels due to global warming is the Maldives. This archipelago, with an average elevation of only 1.5 meters above sea level, is at imminent risk of disappearing due to rising global temperatures and glacier melting (<https://www.unep.org/resources/report/rising-seas-maldives>). At the end of the 2010s, the Maldives began experiencing flooding on its smaller islands during high tides, a phenomenon that threatens the infrastructure and habitability of its territories.

1.2. Fossil Fuels: The Main Source of Emissions

The use of fossil fuels—coal, oil, and natural gas—is the main source of greenhouse gases. Burning these resources for electricity production, transportation, and manufacturing releases enormous amounts of CO₂ into the atmosphere. In 2021, approximately 36.3 gigatons of CO₂ were emitted globally [Global carbon dioxide emissions rebounded to their highest level in history in 2021 \(phys.org\)](#), a significant increase after the temporary drop during the COVID-19 pandemic.

Fossil fuel dependence is responsible for approximately 75% of global CO₂ emissions (<https://www.iea.org/reports/global-energy-review-co2-emissions-in-2021>). In countries like China and the United States, large fossil fuel energy consumers, temperatures have risen at faster rates due to industrial concentration and coal burning for electricity generation.

Beijing (China) Case

In Beijing, summers have become noticeably warmer over the last two decades. In July 2021, temperatures reached 41.9°C, one of the highest records in the Chinese capital in more than 50 years ([Beijing may be facing one of its hottest summers on record | CNN](#)). This extreme heat has led to increased energy demand for air conditioning, which in turn has increased coal use in the region's power plants, exacerbating the cycle of global warming.

Show image of : fossil_fuel_emissions.png



1.3. Deforestation: The Destruction of the Planet's Lungs

Forests are one of the most important sinks for CO₂. They absorb a considerable amount of carbon dioxide and help regulate the climate. However, deforestation, especially in regions like the Amazon and Southeast Asia, is significantly contributing to the rise in global temperatures. The indiscriminate logging for agriculture, livestock, and timber exploitation releases large amounts of carbon stored in trees, worsening the problem.

One Third of the Amazon Has Been Degraded by Human Activities. [One Third of the Amazon Has Been Degraded by Human Activities | Scientific American](#) In 2020, deforestation in the Brazilian Amazon reached its highest level in 12 years, with more than 11,000 square kilometers of forest cleared [Brazil Amazon Deforestation Hits 12-Year High Under Bolsonaro - The New York Times \(nytimes.com\)](#)

Government policies that incentivized the expansion of agriculture and mining in protected areas were one of the main causes. The loss of this vast forest region not only affects global CO₂ emissions but also alters local rainfall patterns, causing more frequent and prolonged droughts in areas dependent on the forest for their hydrological cycle [Agricultural expansion and its impacts on tropical nature - ScienceDirect](#).

2. Consequences of the Increase in Global Temperatures

2.1. Rising Sea Levels and Coastal Erosion

One of the most immediate and concerning effects of rising global temperatures is the rise in sea levels. This phenomenon is due both to the melting of glaciers and ice sheets in Greenland and Antarctica and the thermal expansion of ocean water as it warms <https://www.ipcc.ch/srocc/chapter/chapter-4-sea-level-rise-and-implications-for-low-lying-islands-coasts-and-communities/>

Example: Rising Sea Levels in Bangladesh

Bangladesh, with a large coastal population and scarce infrastructure to handle flooding, is one of the countries most vulnerable to rising sea levels (<https://www.ipcc.ch/sr15/chapter/chapter-3/>). In the last two decades, the country has experienced significant agricultural land loss due to saltwater intrusion. It is estimated that more than 10 million people could become climate refugees by 2050 if current trends continue

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2.2. Extreme Weather Events

Extreme weather events—heatwaves, hurricanes, droughts, and wildfires—have become more frequent and destructive as a result of rising temperatures. The additional energy in the atmosphere is intensifying these events, with devastating consequences for economies and human lives.

Heatwaves in Europe (2022)

In the summer of 2022, Europe suffered an unprecedented heatwave, with temperatures exceeding 40°C in several countries. In France, record temperatures of 42.9°C were reached in Nantes, while Spain and Portugal experienced massive wildfires that destroyed thousands of hectares [Climate change: Summer 2022 smashed dozens of UK records \(bbc.com\)](https://www.bbc.com/news/health-61844444). In Spain alone, more than 1,700 people died due to health complications associated with extreme heat (<https://www.reuters.com/world/europe/deaths-exceed-1700-spains-heatwave-2022-07-20/>).

Hurricane Ida (USA, 2021)

Hurricane Ida, which struck the southern United States in August 2021, is a recent example of how storms have become more intense due to global warming. Ida made landfall in Louisiana with winds of 240 km/h, causing massive flooding and infrastructure destruction across the state. Most notably, the unusually warm waters of the Gulf of Mexico fueled the hurricane, giving it devastating energy in the hours before landfall (https://www.nhc.noaa.gov/data/tcr/AL092021_Ida.pdf).

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2.3. Impact on Ecosystems and Biodiversity

Rising temperatures are affecting flora and fauna globally. Species that cannot adapt quickly to new climate conditions face extinction risks. Habitat loss is one of the main challenges ecosystems face.

Arctic Polar Bear Case

The melting of the Arctic is a direct threat to polar bears, which depend on sea ice to hunt seals, their primary food source. According to the World Wildlife Fund (WWF), polar bear numbers have decreased by 30% in some Arctic areas due to ice melting (<https://www.worldwildlife.org/species/polar-bear>). In 2020, scientists warned that if global temperatures continue to rise at the current rate, two-thirds of the polar bear population could disappear by 2050 <https://www.bbc.co.uk/news/science-environment-68253819#:~:text=With%20greater%20legal%20protection.%20polar%20bear%20numbers%20have>

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2.4. Impact in human's health

Increased Heat-Related Illnesses: As global temperatures rise, heat-related illnesses such as heat exhaustion and heat stroke are becoming more common, particularly in vulnerable

populations like the elderly, children, and those with preexisting conditions. An estimated 166,000 deaths occurred due to heatwaves between 1998 and 2017 <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>

Worsening Respiratory Conditions: Rising temperatures contribute to the increase of ground-level ozone and other pollutants, exacerbating respiratory diseases like asthma and bronchitis. Higher pollen counts also lead to more frequent and severe allergic reactions [Climate change, air pollution, and allergic respiratory diseases: a call to action for health professionals - PubMed \(nih.gov\)](#)

Dehydration and Kidney Disease: Higher temperatures and more frequent heatwaves increase the risk of dehydration, which can lead to kidney stones and chronic kidney disease, particularly in regions where people are exposed to prolonged periods of extreme heat <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3774469/>

Vector-Borne Diseases: Warmer temperatures expand the habitats of disease-carrying insects such as mosquitoes and ticks, leading to an increased spread of diseases like malaria, dengue fever, and Lyme disease [Effects of climate change and human activities on vector-borne diseases | Nature Reviews Microbiology](#)

Mental Health Impact: Heat stress has been linked to increases in mental health issues, including anxiety, depression, and even suicide rates. Studies show that for every 1°C increase in average monthly temperature, the suicide rate can increase by up to 2% <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6782719/>

Impaired Sleep: Hotter nights are making it more difficult for people to get proper sleep, which is critical for physical and mental health. Studies show that warmer nighttime temperatures are reducing sleep duration, particularly in regions without widespread access to air conditioning (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5266734/>).

Food and Water Insecurity: Rising temperatures can lead to food shortages by disrupting agricultural productivity and water availability, increasing malnutrition and related health issues like stunted growth in children (<https://www.ipcc.ch/srccl/chapter/summary-for-policymakers/>).

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3. Concrete Examples of Rising Temperatures

3.1. The Summer Heatwave in Europe (2022)

In July 2022, Europe experienced an extreme heatwave that affected several countries, with record temperatures exceeding 40°C in the United Kingdom, France, and Spain. This heatwave not only caused wildfires and deaths but also highlighted the vulnerability of European infrastructure to extreme heat. In the UK, temperatures exceeded 40.3°C for the first time in recorded history, according to the British Met Office [Climate change: Summer 2022 smashed dozens of UK records \(bbc.com\)](https://www.bbc.com/news/health-61844444)

3.2. Wildfires in California (2020)

California has experienced increasingly intense wildfires due to high temperatures and drought. In 2020, the fires destroyed more than 1.7 million hectares, an unprecedented extent in the state. The "August Complex Fire" was the largest fire recorded in California's history, burning over

400,000 hectares, according to the California Department of Forestry and Fire Protection (CalFire) <https://www.fire.ca.gov/incidents/2020/8/16/august-complex/>

3.3. Greenland Ice Melt (2021)

On July 27, 2021, Greenland experienced a massive ice melt due to a heatwave affecting the region. According to the Danish Meteorological Institute, Greenland's ice sheet lost 8.5 billion tons of ice in a single day. This phenomenon contributes to the global rise in sea levels, affecting coastal areas and increasing the frequency and intensity of floods <https://climate.nasa.gov/news/3096/melting-of-greenlands-ice-sheet-passes-the-point-of-no-return/>

4. Measures to Mitigate the Rise in Temperatures

4.1. Renewable Energy

The transition to renewable energy sources such as solar, wind, and geothermal is essential to reduce greenhouse gas emissions. Countries like Denmark and Germany have

demonstrated that it is possible to reduce emissions while increasing the share of renewables in the energy mix. Denmark, for example, produces more than 40% of its electricity from wind sources, while Germany reached 46% in 2020 through combined solar and wind energy (<https://www.iea.org/reports/germany-2020>).

Additionally, solar energy is becoming increasingly accessible. In 2021, global solar energy capacity reached 843 GW, a significant increase compared to previous years. The goal is for this trend to continue as production costs decrease and technologies become more efficient (<https://www.irena.org/Statistics/View-Data-by-Topic/Capacity-and-Generation/Technologies>)

Image to show: renewable_energy.png



4.2. Reforestation and Ecosystem Restoration

Reforestation and the restoration of natural ecosystems can help mitigate climate change by absorbing CO₂ from the atmosphere. Forests act as carbon sinks, capturing CO₂ through photosynthesis. Initiatives such as the Great Green Wall in Africa aim to reforest large areas of land to halt desertification and mitigate climate change effects on the continent.

The Great Green Wall project, which spans 8,000 km from Senegal to Djibouti, aims to restore 100 million hectares of degraded land by 2030. The initiative is expected to capture around 250 million tons of CO₂, improving biodiversity and supporting food security in the region (<https://www.unccd.int/actions/great-green-wall-initiative>).

Image to show: reforestation.png



4.3. International Agreements

The Paris Agreement, signed in 2015 by 195 countries, is one of the most important international agreements in the fight against climate change. Its main goal is to limit global temperature rise to 2°C above pre-industrial levels and, if possible, reduce it to 1.5°C (<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>).

Although the 1.5°C goal is crucial to avoid the most catastrophic consequences of global warming, current emission reduction commitments are insufficient

to achieve this goal. According to a 2021 UN report, current policies would put the world on a trajectory of a 2.7°C increase by the end of the century (<https://www.unep.org/resources/emissions-gap-report-2021>).

To correct this trend, many countries are implementing or expanding their climate commitments through Nationally Determined Contributions (NDCs). However, most current commitments need to be significantly strengthened to close the "emissions gap" and meet the Paris Agreement's goals (<https://climateactiontracker.org/global/cat-thermometer/>).

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Conclusion

The rise in global temperatures, driven primarily by human activity, has generated a tangible impact in all spheres of the planet, from ice melt in Greenland to heatwaves in Europe and wildfires in California. As these extreme events become more common, the urgency to address climate change has never been more critical.

The underlying causes, such as fossil fuel burning, deforestation, and intensive industrial practices, are well-documented and require systemic changes at the global level. Specific examples from 2020 and 2021 demonstrate that we are already witnessing the devastating effects of the climate crisis, from ecosystem destruction to increasing climate refugees and economic losses.

Despite this alarming reality, viable solutions exist. The transition to renewable energy, mass reforestation, and ecosystem restoration, as well as strengthening international agreements like the Paris Agreement, are crucial steps in mitigating global warming's effects. However, current efforts are not enough to reach the necessary goal of limiting global temperature rise to 1.5°C.

The biggest challenge facing humanity is not just implementing these solutions but also global coordination and political commitment to take swift and effective action. The future depends on the decisions we make now. Only through a concerted effort among governments, businesses, and citizens can we reduce the impact of rising temperatures, protect biodiversity, and ensure a habitable planet for future generations.