

GLOBAL CLIMATE CHANGE

Vital Signs of the Planet

EFFECTS

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The current and future consequences of global change



The potential future effects of global climate change include more frequent wildfires, longer periods of drought in some regions and an increase in the number, duration and intensity of tropical storms.

Global climate change has already had observable effects on the environment. Glaciers have shrunk, ice on rivers and lakes is breaking up earlier, plant and animal ranges have shifted and trees are flowering sooner.

Effects that scientists had predicted in the past would result from global climate change are now occurring: loss of sea ice, accelerated sea level rise and longer, more intense heat waves.

"Taken as a whole, the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time."

- Intergovernmental Panel on Climate Change

Scientists have high confidence that global temperatures will continue to rise for decades to come, largely due to greenhouse gasses produced by human activities. The Intergovernmental Panel on Climate Change (IPCC), which includes more than 1,300 scientists from the United States and other countries, forecasts a temperature rise of 2.5 to 10 degrees Fahrenheit over the next century.

According to the IPCC, the extent of climate change effects on individual regions will vary over time and with the ability of different societal and environmental systems to mitigate or adapt to change.

The IPCC predicts that increases in global mean temperature of less than 1.8 to 5.4 degrees Fahrenheit (1 to 3 degrees Celsius) above 1990 levels will produce beneficial impacts in some regions and harmful ones in others. Net annual costs will increase over time as global temperatures increase.

"Taken as a whole," the IPCC states, "the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time."¹

Below are some of the regional impacts of global change forecast by the IPCC:

A Degree of Difference

So, the Earth's average temperature has increased about 1 degree Fahrenheit during the 20th century. What's the big deal?

One degree may sound like a small amount, but it's an unusual event in our planet's recent history. Earth's climate record, preserved in tree rings, ice cores, and coral reefs, shows that the global average temperature is stable over long periods of time. Furthermore, small changes in temperature correspond to enormous changes in the environment.

For example, at the end of the last ice age, when the Northeast United States was covered by more than 3,000 feet of ice, average temperatures were only 5 to 9 degrees cooler than today.

- **North America:** Decreasing snowpack in the western mountains; 5-20 percent increase in yields of rain-fed agriculture in some regions; increased frequency, intensity and duration of heat waves in cities that currently experience them.²
- **Latin America:** Gradual replacement of tropical forest by savannah in eastern Amazonia; risk of significant biodiversity loss through species extinction in many tropical areas; significant changes in water availability for human consumption, agriculture and energy generation.³
- **Europe:** Increased risk of inland flash floods; more frequent coastal flooding and increased erosion from storms and sea level rise; glacial retreat in mountainous areas; reduced snow cover and winter tourism; extensive species losses; reductions of crop productivity in southern Europe.⁴
- **Africa:** By 2020, between 75 and 250 million people are projected to be exposed to increased water stress; yields from rain-fed agriculture could be reduced by up to 50 percent in some regions by 2020; agricultural production, including access to food, may be severely compromised.⁵
- **Asia:** Freshwater availability projected to decrease in Central, South, East and Southeast Asia by the 2050s; coastal areas will be at risk due to increased flooding; death rate from disease associated with floods and droughts expected to rise in some regions.⁶

Global Climate Change: Recent Impacts⁷

| Phenomena | Likelihood that trend occurred in late 20th century |
|--|---|
| Cold days, cold nights and frost less frequent over land areas | Very likely |
| More frequent hot days and nights | Very likely |
| Heat waves more frequent over most land areas | Likely |
| Increased incidence of extreme high sea level * | Likely |
| Global area affected by drought has increased (since 1970s) | Likely in some regions |
| Increase in intense tropical cyclone activity in North Atlantic (since 1970) | Likely in some regions |

* Excluding tsunamis, which are not due to climate change.

Global Climate Change: Future Trends⁸

| Phenomena | Likelihood of trend |
|---|----------------------|
| Contraction of snow cover areas, increased thaw in permafrost regions, decrease in sea ice extent | Virtually certain |
| Increased frequency of hot extremes, heat waves and heavy precipitation | Very likely to occur |
| Increase in tropical cyclone intensity | Likely to occur |
| Precipitation increases in high latitudes | Very likely to occur |
| Precipitation decreases in subtropical land regions | Very likely to occur |
| Decreased water resources in many semi-arid areas, including western U.S. and Mediterranean basin | High confidence |

Definitions of likelihood ranges used to express the assessed probability of occurrence: *virtually certain* >99%, *very likely* >90%, *likely* >66%.

Source: Summary for Policymakers, IPCC Synthesis report, November 2007
<http://www.ipcc.ch/>

¹IPCC 2007, Summary for Policymakers, in *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the*

Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK, p. 17.

²IPCC 2007, Summary for Policymakers, in *Climate Change 2007: Synthesis Report*, p. 11.

³Ibid.

⁴Ibid.

⁵Ibid.

⁶Ibid.

⁷Adapted from IPCC 2007, Summary for Policymakers, *Synthesis Report*, p. 13.

⁸Adapted from Ibid, p. 8.