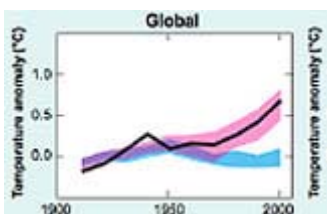




## Climate Change : Global Warming Basics

### New UN Global Warming Report - Facts and Predictions

**The latest report from the Intergovernmental Panel on Climate Change delivered a huge blow to global warming skeptics. Leading climate scientists are now 90 percent sure that human activity is heating up the planet. They present various scenarios that show where global warming could take us by the end of the century. The choice is ours.**



#### Global and Continental Temperature Change

Global temperature changes during the 20th century. The blue line depicts only changes due to natural forcings triggered by solar activity and volcanoes. The red line is made up of changes induced by natural and anthropogenic sources (Graphic IPCC)

First, the facts as outlined by the report. Global warming is a reality and "very likely" human-induced. Although the term "very likely" may seem vague, it is as close as 700 scientists, 2,500 reviewers and countless government officials can get to consensus about if humanity is to blame. Greenhouse gases in our atmosphere have increased since 1750 due to the consumption of fossil fuels, new forms of land use, and agriculture. While atmospheric pollution has had a cooling effect during the last centuries, the massive increase in greenhouse gases has led to a rise of average temperatures by 0.74 degrees Celsius since 1901. Scientists are 90 percent sure that the last half of the 20th century has been the hottest period in the Northern Hemisphere since 500 years.

"Numerous long-term changes in climate have been observed. These include changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones." [IPCC: Summary for Policymakers, p.8]

Scientists have refined their simulations and now have a fairly good idea of the effects of carbon dioxide emissions. A doubling of carbon dioxide levels in the atmosphere, relates to a surface warming of some 3 degrees Celsius plus-minus one degree. Even if we manage to reduce carbon emissions to year 2000 levels such a doubling of carbon dioxide is unpreventable. Warming, the report reads, will not be equally distributed. Effects will be more pronounced in the northern latitudes.

Critics often referred to changes in the sun's radiation to account for global warming. Although scientists have found fluctuations in the sun's radiation, its effects are nearly 20 times weaker than human-induced warming.

Meanwhile glaciers all over the world are declining, an effect that is also perceivable at the fringes of the vast Antarctica ice shield. Scientists say that sea levels have already risen 17 centimeters during the 20th century, most of it due to the simple fact that warm water has a larger volume than cold water. With the melting of icecaps and glaciers, the annual rise has nearly doubled since 1993 to a rate of about 3.1 mm. Even if carbon dioxide emissions can be stabilized, sea levels will keep on rising for centuries until the temperature gain will have reached the deep oceans.

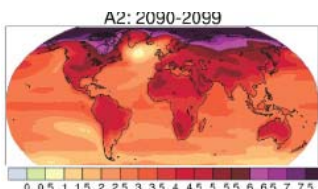
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Findings also show that the atmosphere now holds more water vapor, one of the driving forces of tropical storms and floods. Since the 1960, Westerly winds have gained in strength all over the planet. The Atlantic was particularly effected by more frequent and severe tropical cyclones, a phenomenon in line with rising surface water temperatures. The report says that there is a chance of six out of ten that recent severe storms were boosted by global warming.

Arctic temperatures have increased twice as fast as global average temperatures. Summer ice in the Arctic Ocean is decreasing by 7.4 percent per decade. By the end of the century, the Arctic might well be ice-free in summer. Meanwhile permafrost is on the retreat. Since 1900, the seasonally frozen ground in the Northern Hemisphere has shrunk by some 7 percent. This has freed large amounts of methane, another potent greenhouse gas. To which extent such side-effects amplify ongoing global warming is not yet properly understood. The IPCC's scenarios, therefore, do not account for eventual runaway effects that would speed up global warming.

Precipitation patterns, too, changed over the last century. There is significantly more rain in the eastern parts of North and South America, northern Europe and northern and central Asia. On the other hand, dry spells are more frequent in the Sahel, the Mediterranean, southern Africa and parts of southern Asia.



### Climate Change Scenarios

Three different scenarios for global warming. In the worst case (bottom right) global average temperatures could rise up to 6.4 degrees Celsius by the end of the 21st century. An increase of more than ten degrees is possible in the northern latitudes (Graphic: IPCC)

### The IPCC Scenarios

The world's leading scientists have put together data and expertise available and devised seven climate scenarios for the 21st century. It all depends – they say – on the level of demographic and economic development, and how serious we are about the fight against global warming.

**Level 2000:** If we manage to stabilize our greenhouse gas emissions to the levels attained in the year 2000, we will still feel the heat, but the

increase will be less than a degree over the next hundred years. Unfortunately, this option is not even considered a real scenario but rather a benchmark to compare with more realistic models.

**Global Service Economy:** Scenario B1 presents the most optimistic outlook: by mid-century, global population will hit a peak and decline thereafter. Rapid economic changes will bring about a service and information economy based on clean and efficient technologies. The international community will unite around policy solutions - such as the Kyoto Protocol - for the reduction of greenhouse gases. While all this sounds promising, global warming will still occur, albeit not beyond a range of 1.1 to 2.9 degrees Celsius. Sea level rise between 18 and 38 centimeters until the end of the century.

**Population Growth:** Scenario B2 is less rosy: global population will constantly grow while climate change mitigation efforts have a regional focus. This translates into a temperature rise of some 1.4 to 3.8 degree Celsius. Sea levels increase some 20 to 40 centimeters by 2100.

**Rapid Economic Growth:** The A1 scenario has been split up in three sub-divisions. Each of them is based on rapidly growing economies and a growing number of people, albeit populations will decline towards the second half of the century.

A1FI represents "business-as-usual" - a world that still runs on coal and gas. It is here that predictions are most shocking: temperature gains of some 2.4 to 6.4 degrees are within reach. The sea would rise some 26 to 50 centimeters until the end of the century flooding large coastal cities and numerous islands.

A1B, the most probable scenario given current trends, is also alarming. While fossil fuels are still widely used, they are part of a more balanced energy mix. Still, by the end of the century, temperatures will have risen some 1.7 to 4.4 degrees Celsius, with the oceans gaining some 21 to 48 centimeters. Rainfall is likely to decrease by some 20 percent in the subtropics, while more rain will fall in the northern and southern latitudes. The Gulf Stream will not stop, but it will lose about a quarter of its force.

Finally, A1T is a world that has lived through a third industrial revolution - a widespread conversion to "green" energy sources. It is similar to B1 in the sense that temperatures and oceans will rise, but to an extent that experts such as Hans Joachim Schellnhuber call "manageable".

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