

New International report on climate change published

The latest report ([full report here](#)) published by the Intergovernmental Panel on Climate Change (IPCC) states 'with very high confidence' that human activities have contributed significantly to global warming since pre-industrial times. This is the strongest statement yet by Working Group I of the IPCC, tasked with assessing current scientific understanding of climate change. A summary of current state of knowledge of the climate system by climate scientists, the report states that there is 90% probability that greenhouse gases produced by human activities have caused most of the observed global warming since the mid-20th century.

Global warming has been occurring at 0.2°C per decade in recent years, according to this report. As a result, ice and snow is disappearing worldwide, weather and rainfall patterns are changing, sea level is rising more rapidly and extreme weather events are occurring more frequently. The findings are supported by better observations and analysis of current climate and higher confidence in the ability of models to accurately reproduce past climate and predict future climate conditions since the last report was published in 2001.

Observed global climate changes

Since 2001, improvements in collection techniques, coverage, variety and analysis of observations have assisted in analysis of current and past climate conditions. The concentrations of the main greenhouse gases produced by fossil fuels and changes in land use were almost constant in the atmosphere for thousands of years but have been increasing rapidly since 1750. The rate of increase of carbon dioxide in the atmosphere during the industrial era is described as 'unprecedented' in over 10,000 years. The heating effects of these gases is estimated at 5 times the effects of changes in solar radiation, the main natural cause of climate change.

Increases in average air and sea temperatures, decreasing snow and ice and rising sea level have provided unequivocal evidence of global warming. Eleven of the twelve warmest years since 1850 have occurred in the last twelve years. The 100-year temperature trend was given as 0.6°C in the 2001 report, but has now risen to 0.74°C. Arctic temperatures are increasing at twice the global average rate, and ice sheets in the Arctic, Greenland and the Antarctic are shrinking rapidly. Most of the extra heat going into the climate system has been absorbed by the global oceans, however. As water expands as it heats, this has led to sea level rising by 3.1mm per year in 1993-2003, compared to 1.8 mm per year between 1960 and 2003.

A warmer atmosphere can hold more moisture, and both the global average atmospheric water vapour and the frequency of heavy rainfall has increased. Precipitation has increased in some areas, including northern Europe, and decreased in others, causing longer and more intense drought periods in the Tropics and Subtropics. Widespread changes in extreme temperatures have also been noted, with more heat waves and fewer frost days. Changes in storm tracks and winds have also been attributed to global warming.

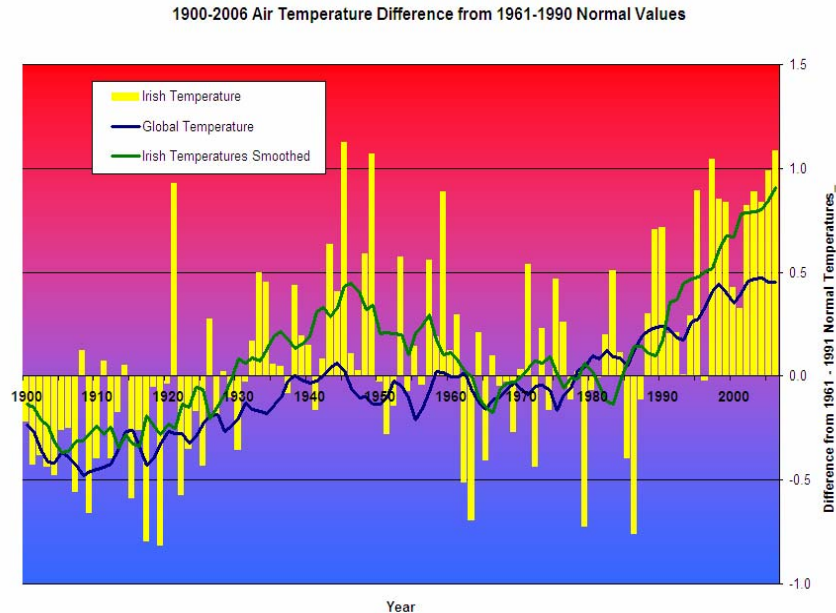
The ability of global models to accurately reproduce past climate and predict future conditions has been improving and model results support the observational evidence that human activities have caused most of the acceleration in global warming in the last 200 years. There is now less than 5% probability that the observed warming is due to natural climate variability. Studies have shown that the pattern of warming is largely due to the combined influences of increasing greenhouse gases and depletion of upper atmosphere ozone. In fact, only climate models which include the effects of greenhouse gases can accurately reproduce the amount and pattern of warming observed in the atmosphere and ocean, and their changes over time.

Observed changes in Irish climate. The picture at end of 2006.

In line with the global picture, Ireland's average temperature has increased by about 0.7°C over the last 100 years, and the rate of increase has been higher in the last couple of decades. The increase has not been uniform over time (see graph), with a warming period from 1910 to the

1940s, followed by a cooling period up to the 1960s. The current warming period commenced around 1980.

2006 was the warmest year on record at both Malin Head and Phoenix Park, which have observations dating back over 100 years, and also at Casement Aerodrome, Kilkenny and Rosslare. In line with the IPCC report, 10 of the 15 warmest years in the last century have occurred since 1990. In the last 100 years, 2006 was the second warmest year, 1945 being slightly warmer, and the last 10 years have been the warmest decade.



While we can be less categorical about wind speeds, there is some evidence of a reduction in annual average wind speeds, with a corresponding decrease in the frequency of high wind speeds and gusts. Increases in total annual rainfall in parts of the West and North have been observed, with some increase in the number of days with heavier rain but there is no clear pattern of change in other areas.

Projections for future changes in global climate

Warming of 0.2°C per decade is projected for the next two decades, according to the IPCC report. This is double the rate that was projected if greenhouse gas emissions had been frozen at 2000 levels. Of this 0.2°C , 0.1°C warming per decade is expected even if there were no further increases in greenhouse gas emissions as the oceans will continue to release heat to the atmosphere.

A number of different scenarios are available to estimate what emissions might be expected in the future, encompassing a range of probable economic, political, population and technological developments in the next century. The best estimate of projected changes in mean global temperature for the end of this century range from 1.8 to 4°C , depending on the emissions scenario used. The range of sea level rise expected is from 0.18 to 0.59m over the same period, but it should be noted that this is likely a conservative estimate.

Projections for changes in Irish climate in the next century

The Community Climate Change Consortium for Ireland (C4I) Project was established in 2003. It is a collaborative research effort between Met Éireann and the UCD Meteorology and Climate Centre and funding is provided by the Environmental Protection Agency, Met Éireann, Sustainable Energy Ireland and the Higher Education Authority. Its objective is to conduct climate change research, develop regional climate modelling capacity, and provide climate model output to Irish scientists. C4I research focuses on generating projections of Ireland's climate in the future and results to date largely agree with the IPCC report findings.

Temperatures in Ireland are predicted to increase by 1.25-1.5°C by 2040 compared to 1961 to 2000. Rainfall is expected to increase in winter by about 15% and summer projections range from no change to a 20% decrease. Extreme rainfall events show more marked changes with more events occurring in autumn and a 20% increase in 2-day extreme rain amounts, especially in northern areas. Taking the projected precipitation changes into account, a hydrological study of the Suir catchment area showed a significant increase in the number of extreme discharge events and a slight increase in their intensity, leading to an increased probability of flooding in the future.

Another C4I study focuses on how the rise in global temperature might affect the intensity and frequency of storms in the North Atlantic. The frequency of very intense storms was found to increase by a factor of 2 by the end of this century compared to the end of the 20th century although there was a slight decrease in the total number of depressions.

For further information, please email IPCC@met.ie stating either 'Future climate' or 'Past and present climate' in the subject line.

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