



This is the print version of the [Skeptical Science](http://sks.to/extreme) article '[Extreme weather isn't caused by global warming](http://sks.to/extreme)', which can be found at <http://sks.to/extreme>.

Is extreme weather caused by global warming?

What The Science Says:

Global warming amplifies the risk factors for extreme weather events - and that is all that Climate Science claims.

Climate Myth: Extreme weather isn't caused by global warming

"The 30 major droughts of the 20th century were likely *natural* in all respects; and, hence, they are "indicative of what could also happen in the future," as Narisma *et al.* state in their concluding paragraph. *And happen they will.* Consequently, the next time a serious drought takes hold of some part of the world and the likes of Al Gore blame it on the "carbon footprints" of you and your family, ask them why just the *opposite* of what their hypothesis suggests actually occurred over the course of the 20th century, i.e., *why*, when the earth *warmed* - and at a *rate* and to a *degree* that they claim *was unprecedented over thousands of years* - the rate-of-occurrence of severe regional droughts actually *declined*." (source: [CO2 Science](http://CO2Science.com))

Whenever there is an extreme weather event, such as a flood or drought, people ask whether that event was caused by global warming. Unfortunately, there is no straightforward answer to this question. Weather is highly variable and extreme weather events have always happened. Detecting trends takes time, particularly when observational records are rare or even missing in certain regions. An increase in extreme weather is expected with global warming because rising temperatures affect weather parameters in several ways. Changes in the frequency of extreme events coinciding with global warming have already been observed, and there is increasing evidence that some of these changes are caused by the impacts of human activities on the climate.

How global warming affects weather parameters

Rising temperatures can have several effects on the factors involved in weather. For example:

- They increase the rate of evapotranspiration, which is the total evaporation of water from soil, plants and water bodies. This can have a direct effect on the frequency and intensity of droughts.
- A warmer atmosphere can hold more water vapour. The atmosphere now holds 4% more water vapour than it did 40 years ago as a result of increasing temperatures. This increases the risk of extreme rainfall events.
- Changes in sea-surface temperatures (SSTs) also have an effect by bringing about associated changes in atmospheric circulation and precipitation. This has been implicated in some droughts, particularly in the tropics.

These changes don't automatically generate extreme weather events but they change the odds that such events will take place. It is equivalent to the loading of dice, leading to one side being heavier, so that a certain outcome becomes more likely. In the context of global warming, this means that rising temperatures increase the odds of extreme events occurring.

Changes in extreme weather events are already being observed

In the US, the Global Changes Research Program published a report in 2009 entitled [Global Climate Change Impacts in the US](#). The [National Climate Change chapter](#) reports the following findings for recent decades:

- Heavy rainfall events have increased both in frequency and in intensity by 20%, and are the main cause behind the increase in overall precipitation in the US. The Northeast and Midwest have seen the greatest increase in such events.
- The frequency of drought has increased in areas such as the Southeast and the West, and decreased in other areas. Rising temperatures make droughts more severe and/or widespread, and also lead to the earlier melting of snowpacks, which can exacerbate problems in vulnerable areas.
- Atlantic hurricanes have increased both in power and frequency, coinciding with warming oceans that provide energy to these storms. In the Eastern Pacific, there have been fewer but stronger hurricanes recently. More research is needed to better understand the extent to which other factors, such as atmospheric stability and circulation, affect hurricane development.

Similarly, Australia has seen the odds of both heavy rainfalls and droughts increase, and similar patterns are being observed worldwide, coinciding with rising temperatures over the past 50 years. Heat waves are also occurring more frequently as temperatures shift upwards:

[Source](#): NASA/Goddard Space Flight Center GISS and Scientific Visualization Studio

In conclusion, although it isn't possible to state that global warming is causing a particular extreme event, it is wrong to say that global warming has no effect on the weather. Rising air and sea temperatures have a number of effects on the water cycle, and this increases the odds for more extreme weather events.

Basic rebuttal written by dana1981

Update July 2015:

Here is a related lecture-video from [Denial101x - Making Sense of Climate Science Denial](#)

[see video at [this link](#).]



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