



This is the print version of the [Skeptical Science](http://sks.to/damagecosts) article '[Climate change isn't increasing extreme weather damage costs](http://sks.to/damagecosts)', which can be found at <http://sks.to/damagecosts>.

Is climate change increasing extreme weather damage costs?

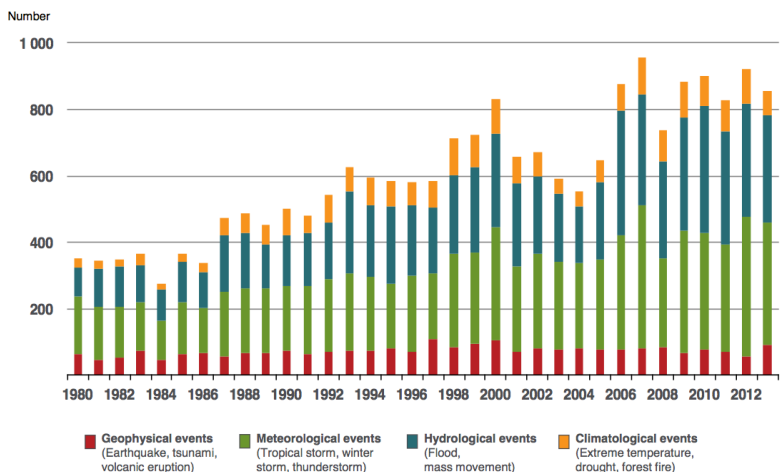
What The Science Says:

The data and research aren't conclusive as to whether climate change is increasing extreme weather damage costs. However, many types of extreme weather are becoming more intense and/or frequent, and disaster costs from extreme weather events are rising.

Climate Myth: Climate change isn't increasing extreme weather damage costs

"Disasters Cost More Than Ever — But Not Because of Climate Change" ([Roger Pielke Jr.](#))

Reinsurance company Munich Re provides data about the number of annual disasters, and [the frequency of these events is indeed rising](#).



Munich Re has also [concluded](#) following a study of "Severe Weather in North America" that (emphasis added),

*"Among many other risk insights the study now provides new evidence for the emerging impact of climate change. For thunderstorm-related losses the analysis reveals increasing volatility and a significant long-term upward trend in the normalized figures over the last 40 years. These figures have been adjusted to account for factors such as increasing values, population growth and inflation ... **In all likelihood, we have to regard this finding as an initial climate-change footprint in our US loss data from the last four decades.**"*

Most arguments against a climate influence on extreme weather damages [come from research by Roger Pielke Jr.](#) His main [argument](#) is that disaster costs are only rising because we've become wealthier.

"In reality, the numbers reflect more damage from catastrophes because the world is getting wealthier. We're seeing ever-larger losses simply because we have more to lose — when an earthquake or flood occurs, more stuff gets damaged."

It's true that *some* of the rising costs due to these disasters can be explained by increased wealth. Geophysical events like earthquakes aren't becoming more frequent, but they are costing more than they used to. However, the frequency of storms and floods is increasing rapidly, and their costs are rising faster

than the costs of earthquakes. This suggests that something (i.e. climate change) is adding to the frequency and costs of these disaster events.

Pielke's research focuses on the 'normalized' costs of land-falling hurricanes in the USA, where he accounts for rising wealth and population density in regions prone to hurricanes. When accounting for a few such factors, Pielke finds no long-term trend in 'normalized' damages, and thus concludes that climate change isn't making these storms any more expensive. He argues we've just got more stuff in areas hit by hurricanes, and that increase in stuff is what's causing storm costs to rise.

However, Pielke ignores some important factors in his normalization procedure. For example, our engineering has improved significantly over the past century to make buildings more resistant to hurricane damage. We now have instruments orbiting the Earth on satellites tracking storms, weather models predicting their paths, and communications technology to warn people well before they make landfall. This technology costs money, as evidenced by the fact that [funding cuts](#) may soon cripple our ability to predict hurricane tracks, for example. Yet Pielke fails to account for the costs of these improved technologies. [This point was made by Judith Curry in 2007.](#)

"The second problem with the analysis is that the paper does not account for major engineering improvements that rendered these regions in Florida less susceptible to damage."

Kevin Trenberth also made this point [in Science in 2010.](#)

"He completely ignores the benefits from improvements in hurricane warning times, changes in building codes, and other factors that have been important in reducing losses."

[Munich Re](#) also disagrees with Pielke (emphasis added),

"Several of the events of 2013 illustrated how well warnings and loss minimisation measures can restrict the impact of natural catastrophes. In the case of the most recent winter storms in Europe, for example, the losses remained comparatively low", said Torsten Jeworrek, Munich Re Board member responsible for global reinsurance business.

Curry also points out that the lack of a long-term trend in hurricane damage losses in Pielke's analysis depends heavily on two large, expensive hurricane strikes in the 1920s (the Great Miami Hurricane of 1926 and the Lake Okechobee Hurricane of 1928). However, property values were badly inflated leading up to the US stock market crash of 1929, and Pielke fails to account for this inflation factor. Curry concludes,

"If you omit the data prior to the 1930's, and look for the decade early in the period with the largest total damage, it turns out to be 1936-1945 ... The period post 1929 with the greatest amount damage is 1996-2005, which is 84% greater than the period 1936-1945. Such a conclusion is counter to Pielke's conclusion that found no trend in damage."

Pielke has dug himself even deeper into a hole in [trying to support this myth](#) by claiming that efforts and technologies to mitigate disaster damages don't make a difference in damage trends *"for [floods](#), [U.S. hurricanes](#) or [tornadoes](#)."* The problem is that those referenced papers he links don't support his claims.

The US hurricanes reference goes to one of Pielke's own papers, published in 2008. [That paper](#) specifically states,

"The normalization methodologies do not explicitly reflect two important factors driving losses: demand surge and loss mitigation. Adjustments for these factors are beyond the scope of this paper, but it is important for those using this study to consider their potential effect."

The paper includes a brief discussion of improved building codes in Florida potentially reducing disaster losses by up to 40%, but then dismisses their importance by claiming *"As strong codes have only been implemented in recent years and in some cases vary significantly on a county-by-county basis, their effect on overall losses is unlikely to be large."* However, this speculation is not substantiated with any sort of analysis, does not include areas outside of Florida, and does not include mitigation measures other than improved building codes.

In fact, [a study of Florida building performance](#) found that homes built after 2002 sustained less average hurricane damage than those built between 1994 and 2001, which in turn sustained less damage than those built before 1994. This is strong evidence that improvements in building resistance to hurricane damage is making a marked difference in damage losses – a difference Pielke does not account for.

Elsewhere, Pielke referenced a 2011 paper by Barthel & Neumeyer to try and support his argument that mitigation makes no difference in cost trends. However, the same authors [published a paper in 2012](#) that concluded (emphasis added),

*"A trend analysis of normalized insured damage from natural disasters is not only of interest to the insurance industry, but can potentially be useful for attempts at detecting whether there has been an increase in the frequency and/or intensity of natural hazards, whether caused by natural climate variability or anthropogenic climate change...We find no significant trends at the global level, **but we detect statistically significant upward trends in normalized insured losses from all non-geophysical disasters** as well as from certain specific disaster types in the United States and West Germany."*

Another paper, [Schmidt et al. \(2009\)](#) also looks at US hurricane losses and concludes,

"In the period 1971–2005, since the beginning of a trend towards increased intense cyclone activity, losses excluding socio-economic effects show an annual increase of 4% per annum. This increase must therefore be at least due to the impact of natural climate variability but, more likely than not, also due to anthropogenic forcings."

In short, Pielke's own paper does not remotely support Pielke's claim that mitigation doesn't make a difference in US hurricane disaster damages. Pielke has misrepresented his own research. The other referenced papers don't seem to support Pielke's claims regarding flood or tornado mitigation either, and research Pielke neglects does find rising trends in normalized disaster losses in some areas, like from US hurricanes and severe thunderstorms.

It's also not surprising that hurricanes would now be doing more damage, because research has shown that [the most intense hurricanes are already occurring more often](#) as a result of human-caused global warming. This, combined with rising sea levels, has also led to larger storm surges and the costs of the damage that goes with them. As [Grinsted et al. \(2013\)](#) concluded,

"we have probably crossed the threshold where Katrina magnitude hurricane surges are more likely caused by global warming than not."

Global warming also adds moisture to the atmosphere, with the increase in precipitation also [adding to the flooding associated with these storms](#), and the damages they cause.

Oddly, Pielke seems to contradict himself in his concluding statement, saying,

"As countries become richer, they are better able to deal with disasters — meaning more people are protected and fewer lose their lives. Increased property losses, it turns out, are a price worth paying."

This implies that Pielke understands that the costs of the technologies that he neglects, because those costs "are a price worth paying." Apparently they're just not worth including in his calculations.

It's also worth noting that another of Pielke's claims, "In fact, today's climate models suggest that future changes in extremes that cause the most damage won't be detectable in the statistics of weather (or damage) for many decades," is not remotely true, as illustrated in this post. To support this incorrect claim, Pielke references his own work, which is limited to the statistics of economic loss data for tropical cyclones only (and is contradicted by other research on that subject, as discussed above). However, trends in many extremes are already detectable, including in North Atlantic hurricane intensity (e.g. see [Emanuel 2005](#), [Elsner et al. 2008](#), [Knutson et al. 2010](#), [Emanuel 2012](#), [Kunkel et al. 2013](#), [Grinsted et al. 2013](#), [Holland and Bruyère 2013](#)). Pielke's own paper even acknowledges this point, so once again he's misrepresented his own research:

"This result confirms the general agreement that it is far more efficient to seek to detect anthropogenic signals in geophysical data directly rather than in loss data"

The bottom line is that many types of extreme weather are being [intensified by human-caused global warming](#), and that will continue in the future. And there is evidence that climate change is adding to the costs of extreme weather damage.





Skeptical Science explains the science of global warming and examines climate misinformation through the lens of peer-reviewed research. The website won the Australian Museum 2011 Eureka Prize for the Advancement of Climate Change Knowledge. Members of the Skeptical Science team have authored peer-reviewed papers, a [college textbook on climate change](#) and the book [Climate Change Denial: Heads in the Sand](#). Skeptical Science content has been used in university courses, textbooks, government reports on climate change, television documentaries and numerous books.



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