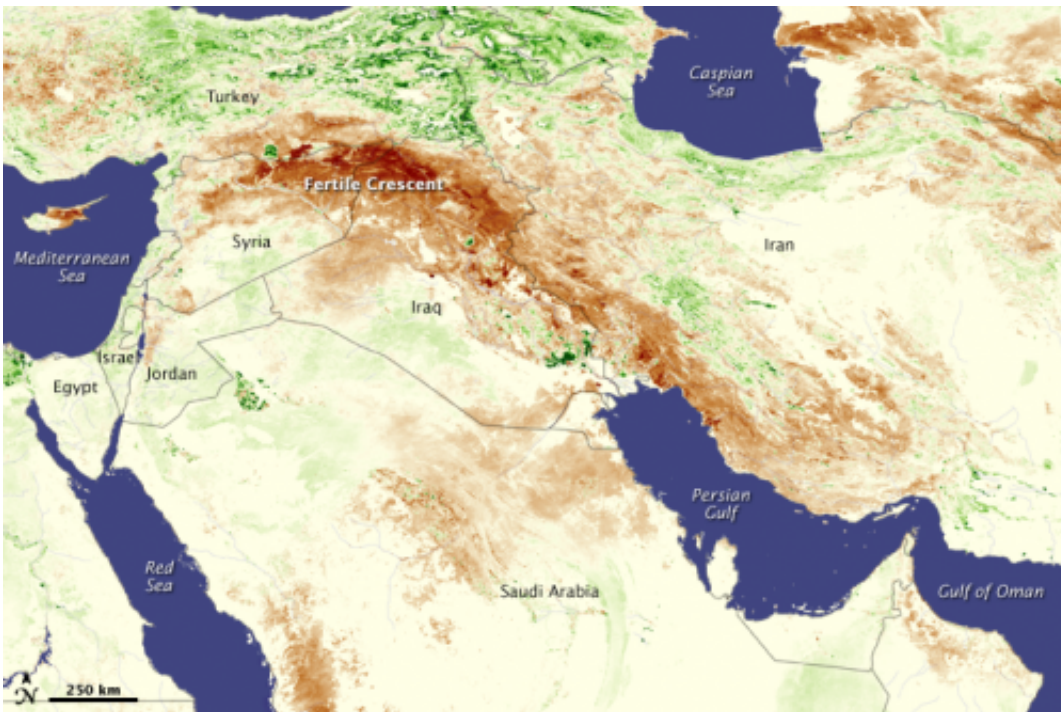


Did climate change help spark the Syrian war?

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From 2006-2010, an unprecedented drought (brown areas) spread over much of Turkey, Syria and Iraq. Syria was especially vulnerable to its effects. Credit: NASA

A new study says a record drought that ravaged Syria in 2006-2010 was likely stoked by ongoing manmade climate change, and that the drought may have helped propel the 2011 Syrian uprising. Researchers say the drought, the worst ever recorded in the region, destroyed agriculture in the breadbasket region of northern Syria, driving dispossessed farmers to

cities, where poverty, government mismanagement and other factors created unrest that exploded in spring 2011. The conflict has since evolved into a complex multinational war that has killed at least 200,000 people and displaced millions. The study appears today in the leading journal *Proceedings of the National Academy of Sciences*.

"We're not saying the drought caused the war," said Richard Seager, a climate scientist at Columbia University's Lamont-Doherty Earth Observatory who coauthored the study. "We're saying that added to all the other stressors, it helped kick things over the threshold into open conflict. And a drought of that severity was made much more likely by the ongoing human-driven drying of that region."

A growing body of research suggests that extreme weather, including high temperatures and droughts, increases the chances of violence, from individual attacks to full-scale wars. Some researchers project that manmade global warming will heighten future conflicts, or argue that it may already be doing so. And recent journalistic accounts and other reports have linked warfare in Syria, Iraq and elsewhere in part to environmental issues, especially lack of water. The new study, combining climate, social and economic data, is perhaps the first to look closely and quantitatively at these questions in relation to a current war.

The recent drought affected the so-called Fertile Crescent, spanning parts of Turkey and much of Syria and Iraq, where agriculture and animal herding are believed to have started some 12,000 years ago. The region has always seen natural weather swings. But using existing studies and their own research, the authors showed that since 1900, the area has undergone warming of 1 to 1.2 degrees Centigrade (about 2 degrees Fahrenheit), and about a 10 percent reduction in wet-season precipitation. They showed that the trend matches neatly with models of human-influenced [global warming](#), and thus cannot be attributed to natural variability.



An estimated 1.5 million people fled Syria's drought-stricken areas, many of them to the peripheries of cities already swollen by refugees from the next-door war in Iraq. Credit: Stephen Starr/IRIN

Global warming has had two effects, they say. First, it appears to have indirectly weakened wind patterns that bring rain-laden air from the Mediterranean, reducing precipitation during the usual November-April wet season. Second, higher temperatures have increased evaporation of moisture from soils during the usually hot summers, giving any dry year a one-two punch. The region saw substantial droughts in the 1950s, 1980s and 1990s. However, 2006-10 was easily the worst and longest since reliable recordkeeping began. The researchers concluded that an episode of this severity and length would have been unlikely without the long-term changes.

Other researchers have observed the long-term drying trend across the entire Mediterranean, and attributed at least part of it to manmade warming; this includes an earlier study from the U.S. National Oceanic and Atmospheric Administration. The Intergovernmental Panel on Climate Change has predicted that the already violent Mideast will dry more in coming decades as human-induced warming proceeds.

The study's authors say Syria was made especially vulnerable by other factors, including sheer population growth—from 4 million in the 1950s to 22 million in recent years. Also, the ruling al-Assad family encouraged water-intensive export crops like cotton. Illegal drilling of irrigation wells dramatically depleted groundwater that might have provided reserves during dry years, said coauthor Shahrzad Mohtadi, a graduate student at Columbia's School of International and Public Affairs who did the economic and social components of the research.

The drought's effects were immediate. Agricultural production, typically a quarter of the country's gross domestic product, plummeted by a third. In the hard-hit northeast, livestock herds were practically all obliterated; cereal prices doubled; and nutrition-related diseases among children saw dramatic increases. As many as 1.5 million people fled from the countryside to the peripheries of cities that were already strained by influxes of refugees from the ongoing war in next-door Iraq. In these chaotic instant suburbs, the Assad regime did little to help people with employment or services, said Mohtadi. It was largely in these areas that the uprising began.

"Rapid demographic change encourages instability," say the authors. "Whether it was a primary or substantial factor is impossible to know, but drought can lead to devastating consequences when coupled with preexisting acute vulnerability."

Solomon Hsiang, a professor of public policy at the University of

California, Berkeley who studies climate and conflict, said the study is "the first scientific paper to make the case that human-caused [climate change](#) is already altering the risk of large-scale social unrest and violence." Hsiang said this is not the first time the region has faced the issue: research by other scientists has suggested that the Akkadian Empire, spanning much of the Fertile Crescent about 4,200 years ago, likely collapsed during a multi-year [drought](#).

Marshall Burke, an environmental scientist at Stanford University who studies climate and agriculture, said, "There were many things going on in the region and world at that time, such as high global food prices and the beginning of the Arab Spring, that could have also increased the likelihood of civil conflict." But, he said, the study is "consistent with a large body of statistical evidence linking changes in climate to conflict."

The study's lead author is climatologist Colin Kelley, who did the work while working on his PhD. at Lamont-Doherty Earth Observatory; he is now a postdoctoral researcher at the University of California, Santa Barbara. It was also coauthored by climate scientists Mark Cane and Yochanan Kushnir, also of Lamont-Doherty.

More information: Climate Change in the Fertile Crescent and implications of the recent Syrian drought, *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1421533112

Provided by Columbia University

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