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April 17, 2009

Study Finds Pattern of Severe Droughts in Africa

By [ANDREW C. REVKIN](#)

For at least 3,000 years, a drumbeat of potent droughts, far longer and more severe than any experienced recently, have seared a belt of sub-Saharan Africa that is now home to tens of millions of the world's poorest people, climate researchers report in a new study.

The last such drought, persisting more than three centuries, ended around 1750, the research team writes in the April 17 issue of the journal [Science](#).

The scientists warned that more such mega-droughts are inevitable, although there is no way to predict when the next one could unfold.

That sobering prediction emerged from the first study of year-by-year climate conditions in the region over the millennia, based on layered mud and dead trees in a crater lake in Ghana. Although the evidence was drawn from a single water body, Lake Bosumtwi, the researchers said there was evidence that the drought patterns etched in the lake bed extended across a broad swath of West Africa.

The lead authors of the report, [Timothy M. Shanahan](#) of the University of Texas at Austin and [Jonathan T. Overpeck](#) of the [University of Arizona](#), warned that [global warming](#) resulting from human-generated greenhouse gases was likely to exacerbate those droughts and that there was an urgent need to bolster the resilience of African countries in harm's way.

Kevin Watkins, director of the office of [Human Development Reports of the United Nations](#) described the study as "a "critical report."

"Many of the 390 million people in Africa living on less than \$1.25 a day are smallholder farmers that depend on two things: rain and land," he said. "Even small climate blips such as a delay in rains, a modest shortening of the drought cycle, can have catastrophic effects."

Given the sub-Saharan region's persistent vulnerability, Mr. Watkins added, the new findings and the prospect of further global warming could be "early warning signs for an unprecedented and catastrophic reversal in human development."

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The study said that some of the past major droughts appeared to be linked to a distinctive pattern of increases and reductions in surface temperatures of the Atlantic Ocean, known as the Atlantic multidecadal oscillation.

Typically over the last 3,000 years, a severe drought developed every 30 to 65 years, the researchers said. But several centuries-long droughts in the climate record, the most recent persisting from 1400 to around 1750, are harder to explain, they said.

While that extraordinary drought occurred during a cool spell in the Northern Hemisphere called the “little ice age,” other sustained extreme droughts appear to have hit West Africa at points when the world was relatively warm over all, they reported.

To gather the data, the research team extracted cylinders of mud from the lake bed. The bottom of the circular lake, formed when a crater was blasted into the region one million years ago, has unusually fine layers of mud. Each layer represents a year’s accumulation, yielding a trove of chemical and physical clues to past temperatures and other conditions.

The team also studied wood samples from ancient dead trees that still poke from the lake’s surface, in areas that were exposed and forested during dry spells several centuries ago but are now under 45 to 60 feet of water.

Recent climate data from the lake analysis were compared with weather records from across the region, providing confidence that the lake record was a reasonable reflection of conditions elsewhere, according to the paper.

In interviews, a range of independent experts on climate and African poverty said that the study underlined that it was important for developed countries to curb greenhouse gases to keep climate shifts around the globe in as manageable a range as possible.

But many stressed that the most urgent concern arising from the study was for the welfare of tens of millions of people with little capacity to endure today’s vagaries in rainfall, let alone epic dry spells.

[Richard Seager](#), a climate scientist at the Lamont Doherty Earth Observatory of [Columbia University](#) who has studied past extreme droughts in other dry areas, including the American Southwest, described the century-scale droughts revealed in the lake mud as “startling.”

He said the study showed that much more work was needed to refine computer simulations of climate so they could replicate such phenomena. Only then is there a chance that scientists can move toward predicting climate shifts reliably in particular regions with specific time frames, he noted.

“The most pressing problem we now face is to predict climate in the near-term future — years to decades,” Dr. Seager said.

Mr. Watkins of the United Nations said that the urgency was multiplied by high population growth rates in West Africa. Just in the last century, when its populations were far smaller, periodic droughts in sub-Saharan Africa claimed hundreds of thousands of lives or even more.

In an interview, Dr. Shanahan of the [University of Texas](#) said that the growing population density around Lake Bosumtwi itself, which is 20 miles southeast of Ghana’s second biggest city, Kumasi, suggested the potential human impact of a seismic drought. (From 1972 to 1974, when Ethiopia’s population was around 31 million people, one million died in a severe drought, for example. Today Ethiopia has more than 70 million residents.)

“There was nothing between the lake and Kumasi when we first went there,” Dr. Shanahan said. “But three years later it’s a traffic jam.”

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