Exploring whether water shortages are due to climate change or local factors

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Human-induced climate change plays a clear and significant role in some extreme weather events but understanding the other risks at a local level is also important, say research studies just published. Oxford researchers examined serious droughts in Brazil, East Africa and the eastern Mediterranean.

Oxford researchers found that while there was a clear influence of human-induced climate change being responsible for the failing rains in

the Levant region, the fingerprint of human activity was not detected in the other two where causes of water shortages were found to be local factors, such as increased water demand, population growth or methods used for irrigating the crops.

A study of a severe drought in São Paulo, the largest city in South America with a population of about 20 million, found that human-induced climate change was not a major influence. The researchers, led by Dr Friederike Otto of the Environmental Change Institute, examined the drought in terms of lack of rainfall, water availability, and water demand. They found the consequences of the drought – which included temporary water shut-offs, a spike in dengue fever cases, and higher electricity prices – were a result of low water availability combined with the numbers of people involved and damage to the infrastructure system. They also concluded that the lack of rainfall in southeast Brazil in 2014 and 2015 while unusual was not unprecedented, with similar dry periods occurring before, with the most recent being in 2001.

Dr Otto said: 'It's clear that a lack of rain and changes in evaporation were not the only players in the Brazilian drought. We therefore looked beyond the weather and found that the increased demand for water caused by a quadrupling of the city's population since 1960 and rising water use increased risks of water shortages in this area.'

The second Oxford-led study by Dr Toby Marthews focused on the Horn of Africa and showed that droughts are a natural part of the climate in this region; yet, despite this, the population is heavily dependent on rain-fed agricultural methods. This made the population extremely vulnerable when there was no rain – as happened in the 2014 growing season, says the study. It adds though there was no influence of human-induced climate change causing a lack of rain that year, it had led to higher temperatures and incoming radiation, making the population more vulnerable.

The third study focused on a lack of rainfall in what should have been the raining season in the Levant region in 2014. The researchers found human-induced climate change increased the risk of such a severe and unprecedented drought occurring by around 45%. Co-author Daniel Mitchell, from the Environmental Change Institute, said: 'We used local station data and the modelling framework provide by the weather@home project to find clear signals for human influence on this uniquely persistent drought. The study suggests those living in the southern Levant region should be considering adaptations and ways of reducing the risks of extreme weather events, particularly if weather is set to become increasingly extreme in the future.'

Researchers from the ECI have led and co-authored five of the published studies that appear in the *Bulletin of the American Meteorological Society*'s annual special report, Explaining Extreme Events of 2014 from a Climate Perspective, which investigates the causes of a wide variety of extreme weather and climate events from around the world. All of the five rely on simulations provided by members of the public in the distributed computing framework weather@home. This project uses the combined power of tens of thousands of home computers to simulate the risks of human influence in extreme weather events.

Dr Otto, who leads the weather@home project, said: 'The field called "extreme event attribution", which looks for the fingerprints of human-caused warming in extreme weather events, has made considerable advances over the past decade. The goal of extreme event attribution science is to provide this evidence and we are in a unique position to provide the necessary modelling framework to look into the changing statistics of rare and unprecedented events.'

More information: Explaining Extreme Events of 2014 from a Climate Perspective. www2.ametsoc.org/ams/index.cfm … climate-

perspective/

Provided by Oxford University

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