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Global impact of wildfires to intensify due to human-induced climate change

The global economic and environmental impact of wildfires is likely to worsen as a result of human-induced climate change and land-use patterns, according to a team of international fire researchers.

In a paper published in the journal Nature Reviews: Earth & Environment, the researchers describe global and regional trends in fire activity and project what is expected to come down the pipeline in the future.

Fire has been a natural feature of the Earth system for the last 420 million years and has shaped the evolution of plants, animals, and natural and chemical processes, says University of Tasmania Professor of Pyrogeography and Fire Science David Bowman.

The interaction between climate, vegetation and fire occurrence has led to distinct fire regimes, which are characterised by their frequency, seasonality, geographic scale and pattern, and environmental effects.

“Past climate change is known to have influenced the extent, frequency and intensity of landscape fires by affecting vegetation patterns, fuel abundance and drought. Currently, human-induced climate change is altering rainfall patterns and increasing temperatures, resulting in more frequent extreme fire events,” Professor Bowman said.

“Extremely intense fires can trigger the development of pyrocumulonimbus storms, which are powerful convective thunderstorms that can reach the stratosphere and create localised weather, including rain, hail, lightning and pyro-tornadoes.”

In Australia, Professor Bowman highlights the difficulties in separating the influences of climate change from the effects of stopping traditional Aboriginal fire management practices following European colonisation in the early 19th century.

However, the effects of climate change are evident in the increasing number of extreme fire events – including the Black Summer fires of 2019-20 during which 35 pyrocumulonimbus storms were recorded, doubling the known records of these extreme events.

“In the western Tasmanian wilderness, the number of lightning-ignited fires and the area burned as a result has also sharply increased since 1980-1985, from burning an average of around 100ha annually to over 200,000ha in 2019, including rarely burned Gondwanan rainforests,” Professor Bowman said.

This spike in fire intensity and severity has also been recorded at various other locations around the world, including Chile, Canada, Portugal and California.

“Fire activity prediction is a rapidly changing field, however, the strong association between anomalous fire weather and extreme fire behaviour suggests human-induced climate change will impact future fire regimes; including in those regions already vulnerable to fire disasters, such as the western USA, Mediterranean and southern Australia,” Professor Bowman said.

Importantly, these fire disasters are not just due to climate factors but also the modification of landscapes during the Anthropocene – a term used to describe the current geological age, during which human activity is seen as the dominant influence on climate and the environment.

Fire regimes during this era require adaptation and effective management to promote environmental sustainability and reduce greenhouse gas emissions, the authors argue.

These adaptation and management strategies must be tailored to suit specific settings such as the wildland-urban interface – an environment that is rapidly expanding due to growing urban populations.

“The increased risk of economically and ecologically destructive fires can be reduced using planning and urban design principles, combined with fuel management and fire management,” Professor Bowman said.

“Development of these fire management interventions requires transdisciplinary research that combines insights from natural and social sciences, engineering and technology, and humanities. Such research is also prerequisite for improving global and regional fire models of future fire activity.”

“Vegetation fires in the Anthropocene” was authored by an international team of fire researchers: David Bowman, Crystal Kolden, John Abatzolglou, Fay Johnston, Guido van der Werf and Mike Flannigan.

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