In a dangerously warming world, the grim reality of Australia's bushfire emissions must be confronted

March 5 2024, by Robert Hortle and Lachlan Johnson

Credit: Forest Fire Management Victoria

In the four years since the Black Summer bushfires, Australia has become more focused on how best to prepare for, fight and recover from these traumatic events. But one issue has largely flown under the radar: how the emissions produced by bushfires are measured and reported.

Fires comprised 4.8% of total global emissions in 2021, producing about 1.76 billion tons of carbon dioxide (CO_2). This exceeds the emissions of almost all individual countries except the biggest emitters of China, the United States, India and Russia.

It's crucial to accurately track the greenhouse gas emissions bushfires produce. However, the modeling and reporting of bushfire emissions is a complex, poorly understood area of climate science and policy.

The University of Tasmania recently brought together leading scientists and policymakers to discuss Australia's measuring and reporting of bushfire emissions. The resulting report, just released, shows where Australia must improve as we face a fiery future.

Getting a read on bushfire emissions

By the end of this century, the number of extreme fire events around the world is expected to increase by up to 50% a year as a direct result of human-caused climate change.

Emissions from bushfires fuels global warming—which in turn makes bushfires even more destructive. Estimating these emissions is a complicated and technical task, but it is vital to understanding Australia's carbon footprint.

Australia reports on emissions from bushfires according to rules defined by the United Nations Framework Convention on Climate Change (UNFCCC), and as part of our responsibilities under the Paris Agreement.

Countries estimate bushfire emissions in different ways. Some rely on default data provided by the UNFCCC. In contrast, Australia's modeling combines the area of burned land with highly specific local data on the

types of fuel burned (such as leaves, bark and dead wood) and the amount of different types of gas these fuels emit. This makes it among the most sophisticated approaches in the world.

More transparency is needed

Australia's modeling may be sophisticated but it can also be confusing—even for those who follow climate policy closely. One reason is the complex way we differentiate between "natural" fires (those beyond human control) and "anthropogenic" or human-caused fires such as controlled fuel-reduction burns.

Emissions from natural fires are reported to the UNFCCC, but do not initially count towards Australia's net emissions calculations. This is consistent with guidance from the Intergovernmental Panel on Climate Change.

Estimating fire emissions is vital to understanding Australia's carbon footprint. Pictured: satellite image during the Black Summer fires. Credit: NASA Earth Observatory

However, we believe that to improve transparency and accountability, the federal government should work with the states and territories to provide a separate breakdown of natural and human-caused fire emissions. This data should be made publicly available to provide a clearer picture of bushfire emissions and the impact of climate change on large fires.

Where we must improve

As mentioned above, emissions from natural fires do not initially count towards Australia's net calculations. Consistent with other countries, our modeling assumes that emissions will be offset after the fires because forest regrowth captures carbon from the atmosphere.

This approach is based on current scientific evidence. For example, within two years of the Black Summer fires, 80% of the burned area was almost fully recovered.

If monitoring of a fire site shows regrowth has not fully offset emissions after 15 years, the difference is retrospectively added to Australia's net emissions for the year of the original fire.

But this approach may soon need to change. That's because research sugests we cannot assume forests will recover quickly after bushfires. As bushfires become more frequent and intense, they are more likely to irrevocably change landscapes. Bushfires are also more likely to occur in areas that are not adapted to fire and recover poorly—such as Tasmania's World Heritage-listed northwest.

This has major implications for Australia's emissions accounting.

Another significant gap in our modeling is the contribution of soil carbon to bushfire emissions. Large amounts of carbon are present in organic material in soil.

Currently, international rules do not require soil carbon emissions from fire to be estimated. This is despite emerging research showing the release of soil carbon during bushfires in some landscapes, such as peatlands, is likely to create substantial emissions. Other research suggests that depleted soil carbon can slow the recovery of forests after fire.

There is currently insufficient evidence to include soil carbon emissions from bushfires in Australia's estimates, or to model the effects of soil carbon changes on forest regrowth and carbon capture. More research is urgently needed.

Where to now?

Australia's approach to estimating bushfire emissions is credible and sophisticated. However, our modeling and reporting must be refined as technology improves and the climate changes.

Australia is a fire-prone continent. Our bushfire emissions will increase unless we significantly improve our fire preparedness and management. We must also rapidly reduce emissions from other sectors, to ensure our country is playing its part in the struggle to avoid catastrophic global warming.

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