Why Australian summer is getting more humid

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Has Sydney felt more like Cairns lately? You're not imagining it—millions of Australians up and down the east coast have sweltered through exceptionally high humidity in recent weeks.

It's due to normal weather patterns combined with a boost from global warming. Right now, the temperature of the sea surface is 1–3°C above normal for this time of year up and down the east coast. It's particularly hot around the Queensland-New South Wales border and Tasmania's east coast.

When we have high ocean temperatures, we get more water evaporating. This is taken up by the air, which can hold more moisture when the air is hotter. This moist air is then carried to us by winds, and the sweating begins.

Where does humidity come from?

Humidity is just gaseous water held in the air after evaporating from liquid water or ice. It is called a vapor because it condenses into rain—the more humid, the more likely rain is.

Higher humidity makes us feel hotter in warm weather, and slows the drying of laundry on a clothesline or of plants in the garden.

How do we measure it? Two common ways are the "dew point" and "relative humidity."

At any given air temperature, there's a limit to how much vapor the air will retain. Any vapor above this limit will just condense out. But the limit roughly doubles with every 10°C of warming; the dew point is the temperature where the vapor would hit the limit. The less vapor there is in the air, the colder the dew point.

Relative humidity is the ratio of how much vapor the air has compared to the maximum it would retain.

If you're in Tasmania and see that relative humidity is at 100%, you

might be confused. But this measure essentially tracks how "full" the air is. At 100% relative humidity, the dew point matches the actual temperature and no more vapor can be added. If the dew point is 10°C below the actual temperature, relative humidity is about 50%.

How do we measure it? The dew point can be measured directly using a chilled mirror and a laser to detect condensation. More often it's calculated from measurements of relative humidity and temperature.

Relative humidity determines whether material exposed to the air will moisten or dry out. That's why relative-humidity sensors use cheap water-absorbing materials (early ones used a strand of human hair!).

What does a changing climate mean for humidity?

The world's higher ocean temperatures are unambiguously attributable to global warming, largely from the greenhouse gases we have added by burning fossil fuels. To date, more than 90% of all the extra heat thereby trapped has gone into the oceans.

The amount of water vapor over the oceans has increased by roughly 5% since the industrial era began, in lockstep with global warming.

Global warming will continue until we stop it. That means the atmosphere will keep getting more humid.

If the world manages to keep global warming below 2°C, we should avoid the worst health outcomes from more humidity. But even then, we would expect up to another 5% increase in peak water vapor.

Right now, we are seeing higher-than-normal temperatures in most of our surrounding oceans, with only a few exceptions. The areas hit hardest by rising humidity are mostly those that are already humid, like

Queensland and the Northern Territory.

Although peak dew points are rising, you may be confused to hear average relative humidity is actually falling over land. That's because the land is warming so fast the average dew points aren't quite keeping up with temperature, lowering the ratio.

That means, alas, that Australia faces a double whammy: increasing water stress and bushfire risk as well as sweatier summers.

Humidity can be very dangerous

Our natural cooling system in hot weather is evaporation of sweat. Sweat forms on your skin, and the air evaporates it, taking the heat with it.

But this only works to a point. When the dew point is higher, our self-cooling methods get less and less effective. How important this is depends on how hot you feel. On a moderate but muggy day, you might feel fine until you need to climb four flights of stairs and end up sweaty and exhausted. On a hotter but less muggy day you'd feel the heat at the outset, but would more easily handle the stairs.

The Bureau of Meteorology uses something called "apparent temperature" to capture the combined effect of temperature and humidity, although this assumes you're not exerting yourself.

How you feel with more exertion can be captured by other measures, such as the "wet bulb globe temperature" now being used at sporting events such as the Australian Open.

The Bureau has recently begun providing humidity and apparent temperature forecasts as a beta product, which is great for activity planning.

This type of information will become more important as the heat builds. As humidity increases during peak humid heat episodes, it makes heat stress worse and moves us toward our body's physical limits.

Recent research has shown the combination of humidity and heat could make parts of the planet unlivable if Paris Agreement targets are not met, beginning in India and spreading elsewhere in the tropics—including the Top End of Australia.

We need to prepare now for increasing heat, while doing everything we can to stop the routine burning of fossil fuels as soon as possible to maintain a margin of safety for humanity.

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