

MODERN GREEN HOMES

# Sanctuary

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Smart backyard builds for more flexible housing; monitoring your indoor air quality; sitting pretty with window seats; gardening for wildlife habitat and more

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STUDIO  
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*Come on in!*

SUSTAINABLE HOUSE DAY  
SUNDAY 17 MAY, 2026

Take a sneak peek inside  
10 participating homes and studios



## A BREATH OF FRESH AIR

Monitoring air quality could transform how you live in your home. Rachel Rose explains why and how.

**Above** Rachel's Aranet 4 monitor displaying an acceptable interior carbon dioxide level of 503 parts per million. The monitor also measures temperature and relative humidity.

Humans are very good at sensing temperature: we have built-in monitors for too hot, too cold and the comfy spot in between. True, it varies between individuals and is relative in other ways, but generally we get it. When it comes to sensing the quality of the air we breathe, though? We can't see it and we don't really feel it. By the time our senses can detect the air is polluted, indoor air quality (IAQ) is usually seriously bad. And carbon monoxide and some fine particulate matter can't be picked up at all.

"People tolerate stuffy rooms or symptoms such as headaches, eye and nose symptoms and asthma without recognising that these may be a sign of poor air quality," writes Julie Bennett, a public health researcher from the University of Otago, in a recent paper. "The challenge is that air remains invisible, undervalued and largely absent from building codes and health policy."

Indoor air quality is impacted in a number of ways. Fine particulate matter builds up from burning things: the use of gas for heating or cooking, wood fires, even burning the toast. Fabrics, furnishings and floor covering may offgas volatile organic compounds (VOCs). We create moisture in our homes just by breathing, cooking and showering; too little ventilation sees humidity levels climb, particularly when a

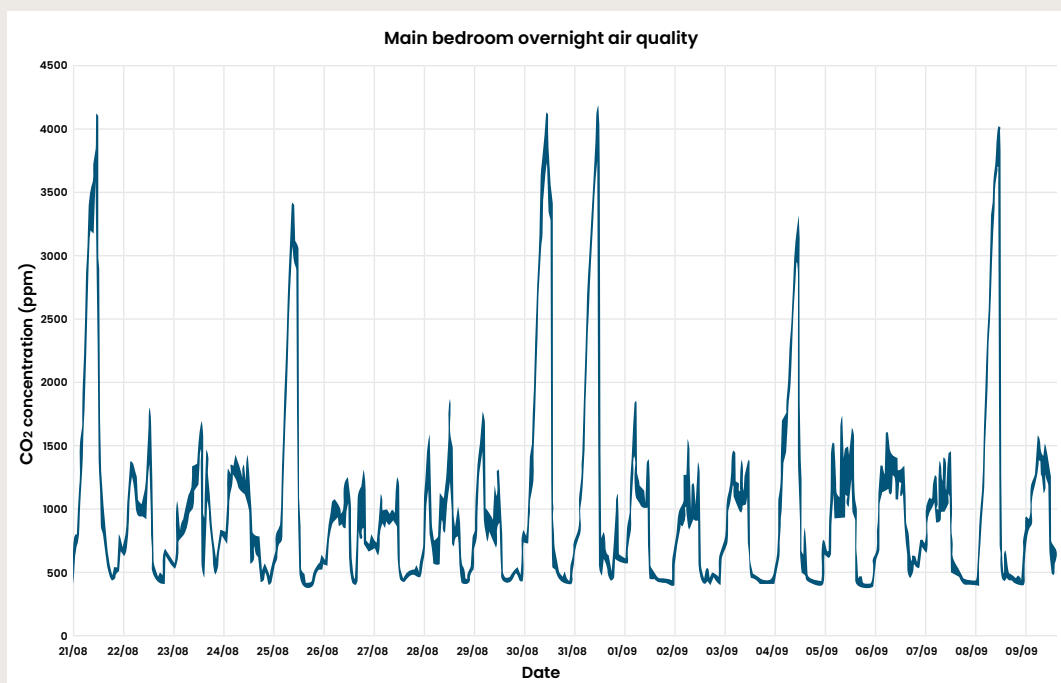
house is underheated. And a damp house is more vulnerable to developing mould, which can aggravate conditions like asthma and respiratory disease or trigger allergic reactions.

Carbon dioxide (CO<sub>2</sub>) levels quickly elevate when people are inside buildings without sufficient ventilation. CO<sub>2</sub> over 1,000 parts per million (ppm) makes people progressively less able to think clearly or concentrate, and is linked to tiredness, headaches, dizziness, increased blood pressure and heart rate, and poor quality sleep.

A reliable monitor showing indoor temperature, relative humidity (RH) and CO<sub>2</sub> levels can tell us a lot about the health of our home and dramatically improve IAQ by training us to ventilate sufficiently.

Australians and New Zealanders are big on natural ventilation. Our building codes require operable windows of a minimum area, and even in wet areas like bathrooms, the first line assumption is that an open window is sufficient to ventilate the space. But these assumptions are usually wrong. Opening just a single window is often insufficient, and even cross ventilation doesn't work in still conditions.

My partner and I and a big dog lived in a small caravan on our house site near Whanganui here in New Zealand for several years. I bought an Aranet CO<sub>2</sub> monitor that also



**Left** This graph shows CO<sub>2</sub> levels in a bedroom occupied by two adults in a Melbourne home (detached, brick veneer, with an average level of airtightness). The tallest spikes show when the bedroom door was closed overnight. The data was collected by a HOBO MX1102 device in winter, when outdoor temperatures discouraged leaving windows open. Even with the door open to the rest of the house, the night-time CO<sub>2</sub> levels are too high to be healthy.



**Above, left and facing page** New Zealand architect and green building advocate Joseph Lyth designed and helped build his first family home on a shoestring budget, achieving Passive House certification and a 10 Homestar rating. A network of Tether devices monitors temperature, humidity and CO<sub>2</sub>. Monitoring provided some valuable insights, most notably that CO<sub>2</sub> levels were too high in the children's shared bedroom overnight. The flow rate in the mechanical ventilation system was increased to deliver more fresh air. Images this page: Dan Scott; facing page: Joseph Lyth

reports temperature and RH, and the data changed our habits of a lifetime after we woke one morning to CO<sub>2</sub> levels over 3,000ppm. Over a couple of weeks, the numbers on the monitor trained me to identify the physical experience of breathing in fuggy CO<sub>2</sub>-saturated air.

It pushed us to start actively ventilating, even when it was very cold outside and the heater was running. We discovered the 'trickle vent' setting on the caravan windows alone was completely ineffective. We upgraded the tiny fan in the kitchen area and left it running continuously whenever the caravan was occupied. The tendrils of cold draught weren't pleasant, but it was a price we were willing to pay once we could see the impact of our choices on the monitor's CO<sub>2</sub> readout. It was also feasible, as we needed so little active heating to keep the small, well-insulated space comfortable anyway.

However, relative humidity remained stubbornly high, around 65 to 75 per cent, despite us taking every precaution. We didn't use the gas cooking facilities (we built an electric camp kitchen in the shed next to the caravan), and wet clothes and towels were banished outside.

We still check the monitor regularly now that we've completed and are living in our new Passive House (see *Sanctuary 71* for more on the house). With our efficient mechanical ventilation system running all the time, it's really easy to keep in the 'Goldilocks zone' across all three metrics. The natural materials used in our house buffer humidity and

help regulate temperature. We confidently run our mechanical ventilation unit at a lower setting than expected, thanks to the monitoring data. It was also very helpful during a power cut that shut the ventilation system down for hours on a winter evening, letting us know when it was time to open some windows and trade off the cold for lower CO<sub>2</sub> levels.

I highly recommend air quality monitoring for any home that relies on opening windows for ventilation. While this approach can provide adequate ventilation in theory, it does rely on humans being home to open and close windows, and being willing to do so even when maintaining acceptable CO<sub>2</sub> and RH levels involves a cost to thermal comfort or peace and quiet.

It's worth noting that some experts think detection of particulate matter, especially the fine PM<sub>2.5</sub>, is even more important than CO<sub>2</sub>. We'll cover PM<sub>2.5</sub> and VOCs, along with various strategies for improving ventilation, in future articles.

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#### ABOUT THE AUTHOR

Rachel Rose is a writer and editor who works on stories from both sides of the Tasman from a peaceful home office in her Passive House farmhouse made from strawbales and clay. She's also a forester, food grower and community organiser.



#### WHICH MONITOR?

Don't waste your money on cheap CO<sub>2</sub> monitors. For reliable results, an NDIR sensor is essential. We chose the Aranet 4, but Inkbird's IAM-T1 model is another alternative. These monitors send data via bluetooth to a free app on a smartphone, enabling you to monitor trends and download data. Follow the instructions about regularly exposing the monitor to outdoor air so that it can recalibrate.

I like that these monitors are small and portable. Once you get used to excellent indoor air quality at home, it can be hard to travel! Portable monitors make it easy to check IAQ metrics in classrooms, work meeting spaces and public venues. During the Covid pandemic, people realised CO<sub>2</sub> levels were a useful proxy for risk of viral infection too (except when air purifiers are in operation).

Networks of fixed monitors, such as the Tether system, are another option. They're more expensive, but can report more metrics.