

NEW ZEALAND / IN DEPTH

# Carbon dioxide levels reach another new record at NIWA's monitoring site on Wellington's coast

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Atmospheric scientist Dave Lowe led the establishment of the Baring Head monitoring station in 1972. Back then, it recorded 326 parts per million (ppm) of CO2 in the atmosphere - now it's 416. Photo: Dave Lowe

There is more carbon dioxide in the atmosphere than ever previously recorded, new data from a New Zealand monitoring station shows.

The pace of increase is also accelerating, as global emissions of CO2 and other greenhouse gases continue to climb.

Leading climate scientists say the latest increases are "really frustrating" after decades of warnings to policy-makers and the public.

One is urging the public to "get out there" and make sure politicians know they want to see action on climate change.

Finalised 2023 data from NIWA's Baring Head clean air monitoring site on Wellington's coast showed an annual average of 416 parts per million (ppm) of CO2 in the atmosphere, up from an average 414ppm the previous year.

Baring Head is part of a **global network of stations** contributing to our overall understanding of how much CO2, methane and nitrous oxide is in the global atmosphere.

The longest-running clean air station in the southern hemisphere, it captures 'baseline' samples of air rushing up from the

Southern Ocean, before it can be tainted by any interactions with activities on land.

Concentrations of CO<sub>2</sub> measured at Baring Head have increased by 28 percent since monitoring began in December 1972, when a concentration of 326ppm was recorded.

The station has never recorded a measurement that low since.

NIWA principal atmosphere technician Gordon Brailsford said the exact concentrations varied depending on where in the world samples are taken, but the trends at Baring Head repeated what scientists were seeing elsewhere.

"Decade on decade we're seeing increases... and when you look at the trend, the trend is steepening."

There was no doubt where most of the increase in CO<sub>2</sub> was coming from, Brailsford said.

"We can trace back through some of our tracer work to say, what's the composition of the CO<sub>2</sub>? Can we see a signal in there - and we use isotopes for this - that tells us what the origin of the increase in CO<sub>2</sub> is? And quite clearly you can see that carbon that's come from fossil sources is contributing to that increased burden in the atmosphere."

Methane concentrations measured at Baring Head stalled for a period in the early 2000s but were now also "zooming up again", he said.

Methane is shorter-lived in the atmosphere - which makes its inclusion in emissions targets controversial - but has a greater immediate warming effect than CO<sub>2</sub>.

Brailsford said each year's data was a chance to pause and consider whether the trends were heading in the right direction.

"At the moment it's not. We're making significant changes to the atmosphere," he said.

"It's frustrating that messages that we were trying to get out even 35 years ago we're still [only] just getting engagement on."

What was happening in the atmosphere was now tangible for many people, he said.

"It's one thing to have limits, guidelines, for how much heating we're willing to accept, but actually all these scenarios still come with big impacts on communities."



NIWA principal atmosphere technician Gordon Brailsford says atmospheric concentrations of all greenhouse gases measured at the Baring Head monitoring site are increasing. Photo: NIWA / Rebekah Parsons-King

Last month, **the world recorded its hottest day** - just one of many climate records tumbling on a regular basis now.

Former climate change commissioner and long-time climate change scientist James Renwick echoed Brailsford's comments.

"It's frustrating but it's also extremely worrying from a human point of view," he said.

"There's the Paris Agreement and there's all the talk at high levels about taking action, but it's obvious that we're not taking action."

New Zealand is **currently projected to miss its emissions targets from 2030**, a new draft emissions reduction plan released by the government shows.

Although the data from Baring Head and other air stations was only one piece of the puzzle, "it's the most important part", Renwick said.

"Climate change is being driven by human activity - by us putting greenhouse gases in the air, in particular carbon dioxide."

CO2's longevity meant every extra bit of it in the atmosphere meant more warming for years to come.

"The more you emit, the more you've got up there, the longer it stays, the warmer it gets. So if we want to stop at 1.5 degrees of warming or even 2 degrees of warming, we've got to take action now."

But instead of heading towards zero carbon emissions, the world was "running fast in the opposite direction", Renwick said.

"We're accelerating our use of burning fossil fuels especially, which is most of what's putting this stuff into the air. So seeing the rate of data, to me, is a real wake-up call."

Waikato University senior climate change lecturer Luke Harrington said there was evidence that the level of global emissions may have peaked.

"But this is the bare minimum required and likely due to the cost of renewables dropping rather than anything else," he said.

Even if emissions stopped rising, the fact that there were already elevated concentrations of CO2 in the atmosphere meant temperatures would keep increasing.

"The warming itself will only stop when net carbon dioxide emissions drop to zero," he said.

"The fact that global emissions might have peaked is like making the effort to reach the start line of a marathon. Well done, but not really anything to congratulate ourselves for."

World Meteorological Organization senior scientific officer Oksana Tarasova said although the long-term trend, or tendency, was the most important to look at, there were other worrying signals in the most recent data.



Luke Harrington Photo: Supplied / University of Waikato

The growth in CO2 concentrations between 2022 and 2023 was higher than the growth in human emissions, she said.

The prolonged La Niña between 2021 and early 2023 - which caused intense rainfall in New Zealand and Australia but created droughts on the opposite side of the Pacific - had massively stressed the forests in the Americas.

"When the forests are stressed they reduce their growth ...which means they reduce the amount of CO2 they take from the atmosphere."

The El Niño-La Niña cycle was a natural phenomenon, but climate change was making the swings more intense when they happened, Tarasova said.

"The fact that we see the response in the biosphere of such a magnitude should be really worrisome."

'Economic agents' such as private businesses had a big role to play in reducing emissions, because they could react much more quickly than governments.

"The political process is very slow," she said. "We should not rely endlessly on policy because it will not be fast enough."

The concept of being "on track" for emissions targets was also questionable, Tarasova said.

The UN Environment Program's **Emissions Gap Report** found that even if every country met its current pledges, it would not collectively be enough to reach the Paris Agreement targets.





The Baring Head monitoring station Photo: NIWA/Dave Allen

Gordon Brailsford said people's interest in climate change trends nowadays was something that gave him hope.

"Thirty-odd years ago it could almost be a conversation stopper, whereas now people are engaged and want to know. And so that's awesome, because if people want to know then they're thinking about the issues," he said.

"That slowing process is not something that's impossible, but it does involve a lot of collective action."

James Renwick said individuals could keep taking steps to reduce their own carbon footprint, but many of the broader solutions to reducing emissions were "not a mystery".

"There's any number of well-known paths that can be taken and the Climate Change Commission has provided advice to the government on all of this," he said.

"We just need the political will to start seeing the action. So if people want to make a noise and complain to their MP, I'd go right ahead.

"We should make sure our elected leaders know that we're concerned - and business leaders for that matter... So don't just sit there and take it - get out there and make your voice heard."



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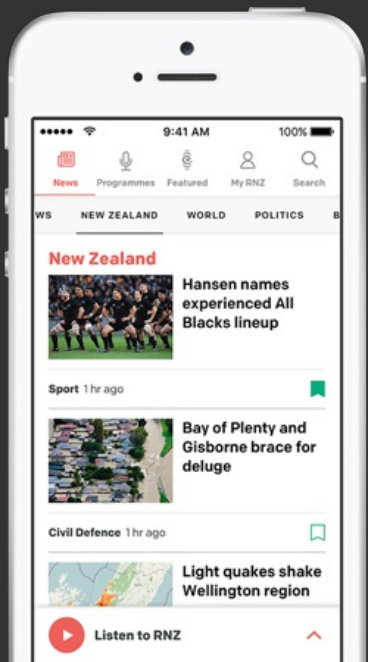
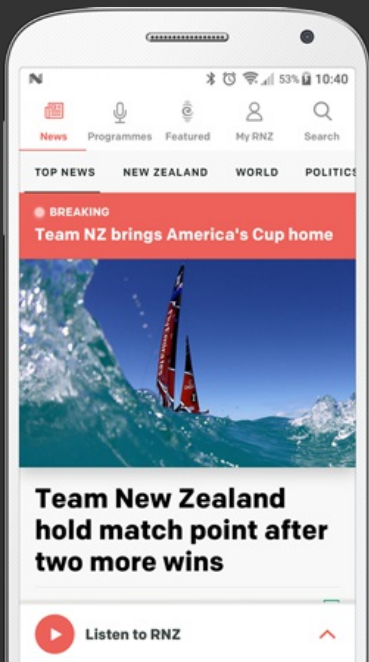


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