

## Climate change forecast getting worse

*It's about time that New Zealand took note.*

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The outlook on climate change is getting grimmer. Ruth Laugesen reports.

For the past 12 months, merchants of doom have enjoyed a permanent rush hour. At every turn, it seems, another eminent scientist is warning of looming disaster.

Professor James Lovelock, originator of the Gaia theory, says rising seas will one day engulf London. Not only that, but the Arctic circle will be premium real estate for those wretched bands of humans who survive the coming floods and lethally hot weather.

His advice? It's too late for timid measures. We need to quickly build nuclear power plants to avoid putting more greenhouse gases into the atmosphere.

Lovelock's views are provocative. The cynics would also add that such views won't hurt sales of his book, *The Revenge of Gaia*.

But in recent months, a cascade of new scientific evidence on climate change has made even mainstream scientists increasingly concerned about what lies ahead.

One is Dr David Wratt, leader of the National Institute of Water and Atmospheric Research's national climate centre. "Over the past few months in particular, knowledgeable scientists have got more concerned that there might not be just a gradual bit of warming, but there could be some more substantial and worrying things happen," he says.

So what are they worrying about, and should we be worried too?

Among the public, many believe the main scientific debate is whether climate change is for real.

After all, American President George Bush is reluctant to address climate change, so perhaps there is something to what the sceptics say.

But for scientists, the caravan moved on some time ago. Now the most urgent question is not whether climate change is real, but how serious and rapid it will be, and whether it will soon be too late to do anything to stop it.

To get a sense of mainstream scientific opinion, most governments look to the Intergovernmental Panel on Climate Change (IPCC), which distills the views of 1300 of the world's top experts.

Each country, including the United States, sends its best and brightest to contribute. Wratt is a star contributor. He sits on the inner circle of the IPCC as one of eight members of the working group that pulls together the report on the current scientific knowledge on climate change.

The last IPCC report, in 2001, concluded humans were indeed changing the climate. And it laid out a series of best estimates on what those changes might be.

Under these forecasts, the outlook for New Zealand a century from now doesn't look unbearable. The sea level is due to rise anywhere between 9cm and 88cm, but our location in the middle of the ocean is expected to take some of the edge off temperature rises. Our temperature is expected to rise around 2C.

The west of the country is expected to get wetter, the east will get drier and more drought-prone. We will be hit by more extreme weather, more storm damage, more erosion, more floods and stronger westerly winds.

We will have new warm weather pests and weeds to contend with. But on the upside, warmer temperatures and more frost-free days should lift agricultural production in many parts of the country. So far, so manageable. New Zealand certainly isn't expected to suffer the spreading deserts problems facing Australia under the same IPCC forecasts. But where New Zealand scientists are watching the international debate closely is the risk of a more dangerous and rapid climate change.

One of Australia's respected senior climate scientists, retired Commonwealth Scientific and Industrial Research Organisation scientist Dr Barrie Pittock, was worried scientists had not been frank enough about the fact the outlook on climate change now included the possibility of calamitous change. "My concern is there's a range of uncertainty in most aspects of climate change. The sceptics tend to look at the low end of the range and say maybe nothing's going to happen, or only very little things. But if you're taking a risk management approach then you've got to also look at the danger of something at the high end happening. That's the basic problem, and the one most scientists have shied away from because they don't want to sound alarmist," said Pittock, author of *Climate Change: Turning Up the Heat*."

Stirring up that debate internationally is NASA climate scientist James Hansen, who was famously gagged by the Bush administration over his views on climate change. Press staff at Nasa tried to prevent reporters speaking to Hansen after a December lecture in which he said time was running out to prevent runaway climate change. "I think sea-level rise is going to be the big issue soon, more even than warming itself," he said.

Hansen said the world was nearing a tipping point that would lead to sea level rises of 25m over coming centuries, the result of melting of most of the ice from Greenland and West Antarctica, as well as a portion of East Antarctica. Coastal dwellers would be continually rebuilding above a rising sea. Hansen called for urgent action to cut greenhouse gas emissions to avoid locking in climate change for good, a position that put him at odds with the American government.

Wratt, who will speak at a conference on climate change in Wellington next month, said we should listen carefully to Hansen. "He may be going further out on a limb over this than many scientists would, but he is a very knowledgeable and respected scientist whose views should not be discounted."

New evidence supports the growing scientific proof that predictions about climate change have been underplayed.

### **Melting Ice**

Until now the IPCC has assumed it would take thousands of years for even a few metres of sea-level rise. At that rate, humans, plants and animals would have plenty of time to adapt.

But new research is leading some scientists to suggest sea levels could rise over hundreds of years instead of thousands. Studies over the past two or three years have found ice shelves around the Antarctic Peninsula are rapidly disintegrating, and the edge of the Greenland Ice Sheet is melting. Other studies have observed rapid recession of Arctic sea ice.

In the latest study, published in *Science* a week ago, satellite pictures show ice from the Greenland Ice Sheet is disappearing into the sea at twice the rate it was five years ago. Researchers from Nasa and the University of Kansas found more than 200cukm of ice was dumped into the sea last year, up from 90cukm in 1996.

But Pittock does not believe extreme suggestions that we will soon be threatened by an 80m rise in the sea level. Although even a small change on current forecasts could bring big problems, he says. Mainstream science predicts sea level rises of about 1m a century. The IPCC forecasts are for sea level rises of between 9cm and 88cm by 2100. "If instead you're getting 2m a century, then that makes it a lot harder to cope with. So even a small chance of accelerating the ice melt is something you have to take seriously," he says.

### **Temperature Rise**

Pittock said two recent studies were also throwing doubt on mainstream forecasts on temperature rises. The IPCC predicts temperatures may rise between 1.5C and 4.5C around the world as a result of doubling of carbon dioxide levels in the atmosphere from pre-industrial levels.

In a 2004 study published in *Nature* magazine, scientists instead put the temperature rise at between 2.4C and 5.4C. Last year, another study published in *Nature* led by scientists at the University of Oxford put the temperature range higher, between 2C and 11C.

"I don't think anyone believes the 11 degrees. But it's beginning to make it look like the 1.5-4.5 range might be a bit conservative," Pittock said. He said a temperature rise of 4C or 5C was looking like a reasonable mid-point now, higher than the 3C forecasting midpoint many climate change modellers had used. And warming at that level would take the globe into unknown territory, including the possibility of more rapid melting of polar ice.

IPCC reports say the higher the temperature goes, the greater the risk of extreme events and abrupt changes in climate.

"Once you get above about 3," Wratt said, "there's likely to be a large increase in the risk of extreme events."

### **A Slowing Gulf Stream**

For some time climate models have predicted the Gulf Stream will be affected by climate change well into the 21st or 22nd century.

The Gulf Stream moves warm water north from the Gulf of Mexico into the Atlantic, warming the climates of Northern Europe and the United Kingdom. A dramatic slowing would be catastrophic, plunging these regions into much colder weather.

In a paper in Nature last year, scientists from the British National Oceanography Centre reported finding that the circulation of water slowed by about 30% between 1957 and 2004.

This faster than expected response to warming temperatures is concerning because it suggests there may be "feedback" loops built into the global climate system, which may bring abrupt change that is more difficult to adapt to than gradual shifts.

Northern hemisphere scientists are closely studying the Gulf Stream, but only a fraction of that effort is going into understanding a huge southern hemisphere current in our own backyard.

The enormous Antarctic circumpolar current moves water throughout the southern oceans. Like the Gulf Stream, it may conceivably slow or accelerate as a result of climate change.

But, said Blair Fitzharris, Emeritus Professor of Geography at Otago University, no one was sure what changes in the current would mean.

"One of the major uncertainties about climate change for New Zealand is the behaviour of the Southern Ocean. It's generally thought such a massive system is only going to respond slowly," he said. "But that doesn't discount that there could be a surprise in there."

### **Tropical Cyclones**

Leading climate researchers are fiercely debating whether the pattern of tropical cyclones is changing because of global warming.

A Nature paper published last year found the number of hurricanes had not increased but their destructiveness and intensity had increased markedly since the 1970s. Such rapid intensification is not predicted by climate change models. So the debate is over whether the models are underplaying the risks we face from climate change.

Is it true, as Lovelock says, that it is too late for anything but radical action?

Wratt says no. At an individual level, even a switch to energy efficient lightbulbs at home is a step in the right direction. "Some of these things might take 100 years to happen, but we might be setting up the situation to happen in the next few decades."