



Towards a hotter, wilder, future

Scientists are looking at how climate change will affect Australians, writes **Clive Hopkins**.

Climate scientists are predicting that heatwaves in Australia, like the one we experienced last summer, are set to become longer, hotter, and more frequent. What are the consequences for us all if this continues, and what can be done to slow down or reverse this trend?

"Extreme heat has a huge impact on human health, especially affecting the elderly, and over time will affect the young and healthy as well," says climate scientist Dr Sarah Perkins from the University of NSW. Perkins' research explores trends in heatwaves, and the natural and human components of observed regional climate change in Australia. Perkins points out that, for human health, the length of heatwaves is a key factor. "One scorcher of a day is OK, but multiple days become a problem," she says. "Night-time temperatures are important, as we need to cool down and 'reboot'."

Perkins, though, is not overly gloomy about her research findings. "Most of us here will cope," she says, "because Australia is a developed country, with the resources to do so. And there seems to be anecdotal evidence that what felt 'extreme' in the past won't feel like that in years to come, as people have time to adapt – although there is a physiological limit to this."

"But I do believe we need to do something about emissions. Green energy is the way to go, reducing emissions effectively, without significantly affecting people's quality of life."

Sophie Lewis is a research fellow in the School of Earth Sciences at the University of Melbourne. Her recent work used climate models to investigate the probability that recent



Sarah Perkins



Sophie Lewis

extreme temperatures in Australia were the result of natural variations as opposed to human activity.

"We looked at both the human and natural contribution, and found we had to run the models for 5500 years to get a similar year with just natural factors," she says. "When we factored in the human influences from greenhouse gases into the climate model, we found it was over 100 times more likely that we would get those temperatures."

Lewis accepts that while there is a consensus in the scientific community over climate change,

CLIMATE FACTS

According to CSIRO, the global average surface temperature has risen by 0.74 degrees in the past century.

Global ocean temperature increased by 0.1 degrees between 1961 and 2003 (to a depth of 700 metres), and Australian oceans have warmed by 0.9 degrees since 1950.

While these figures may seem small, they are already having widespread effects. These include a 10-15 per cent decline in the extent of Arctic sea ice, and a 40 per cent decline in snow depth in the Australian Alps at the start of October over the last 40 years.

Sea levels have risen by an average of 20 millimetres a decade over the last 50 years.

New estimates for 2030 suggest that CO₂ emissions may be 17 to 52 per cent higher than those estimated by the Intergovernmental Panel on Climate Change in 2007 – meaning a global warming of between 0.8 and 1.5 degrees by 2030 may be unavoidable.

there remains a disconnect between what scientists think and wider public perception.

"In science, we say the only certainty is uncertainty," says Lewis. "But we do know that we're loading the dice, so that the odds of those hot summers happening again will be greater."

Another extreme weather event, little understood in Australia, is the thunderstorm. Monash University atmospheric scientist Dr Hamish Ramsay is in the business of understanding them better. "One issue with severe



Hot shock: Australians can expect heatwaves that are more frequent, longer and hotter, but "most of us here will cope", Dr Sarah Perkins says. Photo: Glenn Campbell

thunderstorms in Australia is that we rely on people to call in and report them," he says. "With a low population in rural areas, a lot go unreported."

Ramsay completed his PhD at the University of Oklahoma, in the heartland of America's "Tornado Alley", and caught the storm-chasing bug. "Students have a culture of

storm-chasing there, even if their research isn't directly connected."

Ramsay's upcoming research will look at the distribution and frequency of severe thunderstorms in Australia. Utilising the Bureau of Meteorology's radar network, the work will break fresh ground.

"Most research up to now has been focused on individual events, rather

than the distribution," says Ramsay. "To understand future behaviour of severe thunderstorms, we need to understand their current behaviour, and low population density makes that difficult."

The US, with a great many regional towns, has a good record of tornado reporting, but in Australia, the Bureau of Meteorology only established a

severe weather section in the 1980s.

There is a debate among scientists as to whether thunderstorms will get more severe.

Given that the last 12 months were the hottest recorded in Australia, what can we look forward to over the coming months? The forecast for the rest of year for South Eastern Australia is a wet spring – and a hot summer.

Climate change exodus looms

Climate migration by millions of refugees is coming. Will it be sustainable? **Owen Thomson** investigates.

With the detrimental effects of climate change already forcing inhabitants of some countries from their traditional homes, experts say the need for sustainable migration solutions is becoming urgent.

"Every year millions of people are displaced by droughts, floods and storms," says Johannes Luetz, a PhD researcher from the Institute of Environmental Studies at UNSW. "Combined with global mega trends such as population growth, environmental degradation, resource depletion and sprawling slums in developing countries, it is beyond doubt that the coming years will see many millions more forced from their homes."

In a bid to find more sustainable solutions for climate change refugees, Luetz has travelled around the globe during four years of extensive field research. After a pilot study on Tulun Atoll in the South Pacific, the Berlin-born scientist travelled to Bolivia to study drought and migration, then to slums in Bangladesh and India to study the effects of cyclones on migration. He has also assessed artificially raised concrete islands in the Maldives and resettlement villages for typhoon flood victims in the Philippines.

Although in its relatively early stages, Luetz says the issue of climate

"They're moving to cities and finding they have no marketable skills."

Johannes Luetz

migration will be increasingly widely felt. "Climate migration will be an issue that impacts countries all around the world and Australia, as an obvious destination country, certainly won't be spared," he says.

"There are already islands that are reporting sea level rise at a rate they consider unsustainable and there are a number of places such as Tulun Atoll in Bougainville, Papua New Guinea, where relocation has already started and where there is planning under way to manage the resettlement of some thousands of islanders.

"Relatively few people are being impacted right now, but as sea level continues to rise, which it will, it will just be an issue that will be inescapable."

When it comes to implementing successful climate migration solutions, Luetz says advanced knowledge and preparedness plays a major part, adding that education programs can play a major role in increasing awareness.



Documenting needs: Johannes Luetz is researching sustainable pathways for climate change migration. Photo: World Vision

And with his research showing that affected residents overwhelmingly want to remain where they live, Luetz says the introduction of adaptation measures in their countries is an urgent priority.

"Often people in rural communities are not able to perceive their problems and the bigger picture of global climate change," he says. "So education could be offered at a level that would help people to see this bigger picture and place their own situation in a global context."

Luetz says another priority is ensuring that climate refugees are equipped with the skills to survive and prosper in their new homes, which for many may be alien and

totally incompatible with their former way of life.

"Many of the people affected by climate change are subsistence farmers who find they can no longer survive because their harvests are failing due to drought," he says. "So they're moving to cities and finding they have no marketable skills for the urban context and in many cases are constrained to a life of extreme poverty. If these people could be educated and prepared for an urban context their chances to succeed would be much enhanced."

Crucially, Luetz believes climate migration strategies need to be implemented on two levels, with communities of origin needing to be

prepared to move, and communities of destination being willing to assist with things like integration, retraining, and anticipating the type of skills that may be needed in areas of settlement.

"Positive migration outcomes need to be led by migrants themselves but accountable and responsive government institutions also have a key role to play," he says.

As a possible destination for South Pacific islanders escaping rising sea levels, Luetz says Australia is well placed to play a key role for climate change migrants. "It's ideally positioned to become a world leader in the area of climate migration, both morally and practically."

Academics question research priorities

Melinda Ham

Every year, the Commonwealth government's Australian Research Council and the National Health and Medical Research Council award more than \$1.5 billion to projects across various institutes and universities. But some academics are questioning the government's funding priorities while seeking to attract more students to undertake research in vital but neglected fields.

Professor Mark Hoffman, the pro-vice-chancellor (research) at the University of NSW, doesn't dispute that every bit of research is worthwhile, but there are definitely under-resourced areas, he argues.

"Some areas, like pancreatic cancer or cancer of the oesophagus, for example, aren't getting the funding they need, compared with areas like kids' cancer, because they are just not as attractive, not because they are less important," he says.

Similarly, while cancer and other terminal illnesses may have a huge impact on society, less serious afflictions such as skin diseases may not be life-threatening but significantly diminish sufferers' quality of life and deserve more research funding, he says.

In non-medical areas, Hoffman bemoans the torrent of government money flowing into research for new and improved infrastructure, such as buildings, roads and power stations, when matters of longevity and sustainability are comparatively underfunded.

"It springs to mind that we should also be researching how we can use

our existing infrastructure for longer, instead of, for example, just closing power stations that are inefficient," he says. "Far more urban planning research is also needed."

In a related vein, he says that while research into climate change and its causes attracts a lot of funding, few academics are exploring the potential impact of global warming.

"We need to study how we are going to adapt; how we are going to deal with more floods, droughts and bushfires," he says.

The other elephant in the classroom is the dearth of domestic students pursuing research-based careers, says Professor Tim Marchant, dean of research at the University of Wollongong.

"Most Australian universities are doing a great job of bringing in PhD students from overseas, but we are not attracting enough of our best and brightest graduates here into research," Marchant says. "PhDs get a stipend of \$25,000 a year, which puts them on the poverty line when they can get a starting salary of over \$100,000 in areas like finance."

Marchant emphasises the need for cultural change. If business, industry and academia were to forge stronger links, domestic students would have a greater incentive to undertake graduate work in research and development. Moreover, industry needs to allot greater value to PhDs – as is the case in the United States, Germany and China – if our economy is to remain competitive.

"We are lagging behind many OECD countries in this area," Marchant says.

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