

CLIMATE CHANGE

Newsletter on Global Warming for ANZ Friends
December 2013



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Introduction

I have a feeling that awareness of climate change issues is beginning to spread in this country. A bit more coverage on radio and here and there in newspapers perhaps. A new climate aware political party. A proliferation of electric vehicles from the manufacturers. A start. Offset of course by overriding concerns for jobs, profits, people wanting yet more tourism, yet more international sporting events, yet more mining and drilling for oil.

The challenge of Xmas is to celebrate the birthday of the Man of God in ways appropriate to His concerns, the way He lived, His bias to the poorest and those on the receiving end of injustice. I guess in our age you could include the millions affected by climate change. Food and water shortages, displaced families, land lost to fire and floods etc., the projected loss of up to 60% of all species on earth because the rich have so far failed to take much responsibility for our actions.

So perhaps the challenge of this Xmas, at least in the climate change area, is to deepen our involvement, to offer that Man of God, or however we think of Him, lives committed to eliminating CO₂e emissions - personal and national, the two are intermingled. Not very biblical. Not very traditional. But absolutely essential if we have any concern for people.

*So in this issue we have the usual mix of science, news of people engaged in both the big picture and the more intimate. From Siberia to Southland. Any readers' responses will be published in the next newsletter - as long as they're not denialist! Go Well this Xmas.
Ed.*

The future of our planet is far too important to be left just to our politicians

November 11, 2013

By [Dr Simon Buckle](#)

Two years to go and counting down. That's the real significance of COP19, the Warsaw Conference of the Parties of the UN Framework Convention on Climate Change ([UNFCCC](#)), which runs from 11-22 November. A new universal climate agreement effective from 2020 is what is at stake, and Warsaw is a step on the path.

The COP21 meeting in Paris at the end of 2015 will hopefully be the successful culmination of many years' of hard work by the UNFCCC Secretariat, government climate negotiators and many, many others. It's time for governments to act on the words they agreed in the [IPCC](#) Summary for Policy Makers launched on 27 September – namely that substantial and sustained reductions in emissions are required to limit climate risks. No doubt this is a point Ban Ki-Moon will make at his planned high-level Climate Summit in September 2014.

So how important is the Warsaw COP in this packed schedule to Paris? According to Christiana Figueres, the Executive Secretary of the UNFCCC Secretariat based in Bonn, the meeting is “a pivotal moment to advance international climate action and showcase a growing momentum to address climate change at all levels of society”. That's why there's a Business Forum and a “Cities Day”. There is also a Gender Day to showcase women's role in meeting the climate challenge – a very welcome initiative since the differential impacts on distinct societal groups with contrasting interests and values is at the core of how we decide to respond – or not – to climate change.

Climate change is a critical issue for business, and business has to be part of the solution. Companies realise that they can both become more profitable and improve business resilience by taking climate change and energy efficiency seriously. We need to scale up these efforts significantly to limit the risks from climate change. The car industry is a good example of where European emissions regulation has encouraged innovation to reduce emissions. However, businesses often have shareholders as well as customers and there is only so much they can do without a clear policy framework, a meaningful carbon price to capture the damage emissions do to others and adequate incentives for innovation and investment in clean technologies and new businesses, rather than in the old economy.

There is also a growing recognition that there are clear benefits, even in the short-term, from tackling climate change, including greater energy security. Cities as key concentrators of human, financial and physical capital and resource use are at the forefront of efforts to make the transition to a lower impact and more resilient way of life. In rural areas, renewable technologies can play a valuable role in extending energy access for poor people in developing countries – a role that will grow as technologies get better and cheaper.

But Warsaw has to be about more than just showcasing what could be if we really tried. To create the political conditions for an ambitious and effective mitigation agreement in 2015 covering all the major emitters, there's a huge amount of hard work still to be done. Warsaw can contribute by helping mobilise governments to deliver an ambitious and effective climate agreement in Paris in 2015. Well before the end of next year, we need all the major emitting economies to have put on the negotiating table national commitments to significant and verifiable emissions reductions beyond 2020, with the degree of effort tailored to particular national circumstances. This is not like the Kyoto Protocol. Emissions reductions are needed from developing as well as developed economies; the climate doesn't care where the emissions come from.

Of course, vulnerable, developing economies will need help to make the transition to low-carbon, resilient economies. So a successful outcome in Paris depends on the quantity and quality of financial, technological and adaptation support that the UNFCCC institutions can mobilise for these countries. Warsaw will hopefully take decisions to make the [Green Climate Fund](#), the [Technology Mechanism](#) and the [Adaptation Committee](#) fully operational. But institutions are not enough in themselves. The developed economies have to deliver on their promises of additional financing. Clarity on plans to scale up finance to 2020 will be critical to success in Paris in 2015.

The great advantage of the UN process in tackling climate change is that it brings together over 190 countries with very diverse capacities and perspectives in a sustained effort to create an effective global response to climate change. The voices of the poor and vulnerable can be effective in putting moral pressure on the rich. The UNFCCC process should help us avoid a situation where the climate risks faced by the majority are determined by the decisions of the few.

This strength is of course also the UNFCCC's Achilles Heel. International agreements cannot bind national governments if they don't want to be bound. So whatever is agreed at Paris can only be as ambitious as countries judge is in their own interest, taking account of what others are doing in their self interest. This is why there have been persistent calls for "bottom-up" approaches. While focused groupings, like the Major Economies Forum, can make a valuable contribution to the process, we need the UN process to keep up the pressure and also to provide an independent mechanism for monitoring, reporting and verifying countries' emissions reductions.



As we've seen with the national pledges made after the Copenhagen COP, an agreement in Paris that is based purely on what countries

want to do is unlikely to meet the scale of the challenge. Time is short, perhaps 50 years to make the transition to a much lower carbon world. This is why the UNFCCC is absolutely right to seek to involve a much wider range of non-governmental actors in the discussions at Warsaw and beyond, to try and raise the level of ambition and to redefine what is feasible.

The future of our planet is far too important to be left just to our politicians.

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[Remember, our top climate change scientists are telling us that we developed countries need to achieved zero emissions by 2030 to give a 50/50 chance of holding warming below 2 degrees. Remember also that the UNFCCC has roundly criticised New Zealand's feeble commitments to reduce emissions. Ed.]

Climate change: a survivors' guide

As warnings of global climate change grow ever more dire, John Vidal offers 10 tips on how to prepare for an apocalyptic future

[John Vidal The Guardian](#), Sunday 13 October 2013 18.15 BST

[Although this is about the U.K. and northern hemisphere conditions, and New Zealand will have slightly different climatic changes, John Vidal 's observations on social conditions etc. are probably apposite, and where he writes of the drying out of the Sahel and African rangelands forcing millions of people to move, we can probably substitute Australia, the U.S. and Indonesia. Ed.]

Extremes of heat and rainfall are likely to make natural disasters commonplace in the future. Photograph: Daniel Berehulak/Getty Images

1 Stay cool, dry

Britain is expected to get more extremes of heat and rainfall, so prepare for more severe floods, longer droughts and more powerful storms. No one knows quite what the effect over time will be of a slowing Gulf stream, or the melting of arctic sea ice, but climate scientists [confidently expect temperatures to rise up to 4C by 2100](#). That could mean big shifts in rainfall patterns and a more unpredictable climate. So clear your drains, fix your roof and move to Wales – or at least to somewhere with good [water](#) supply. The worst that could happen? Your grandchildren will inherit

inexorably rising temperatures that render much of the Earth uninhabitable. Their problem? Yes, but yours, too.

2 Move

Sea levels are rising gradually and by the end of the century could be [nearly 2ft higher than they are today](#). So don't pass on that beach hut to your children, and expect to lose acres if you live near the coast in East Anglia and other low lying areas. You won't have to head for the hills for many years, but prepare to view the seaside from behind higher walls and from the dykes that will be needed to protect many coastal towns. By 2100 [the map of Britain will be smaller](#) and many cities are likely to be besieged by climate "refugees" arriving from low-lying areas such as Norfolk.

3 Adapt

[Climate change](#) is going to be very, very expensive, and the poor, the old and the vulnerable will be the most affected because they are least likely to have the money to move house or adapt. Economists such as [Lord Stern](#) and [Jim Yong Kim](#), the new president of the World Bank, expect a 4C temperature rise to result in global economic meltdown – unless countries rapidly shift their economies towards less energy-intensive industries. Stern predicts that warming will knock at least 5% off GDP per year and Kim expects food shortages and conflicts over natural resources and water. Abnormal events such as [Hurricane Sandy](#), which cost \$65bn (£40bn) and the 2011-12 US [drought](#), which cost \$35bn (£21bn) may be just foretasters of the price to be paid. On the other hand, there's serious money to be made adapting cities and industries to climate change and reducing emissions.

4 Grow your own

More heat and a longer growing season should make it easier to grow some crops in northern countries such as Britain, Russia and Canada, and more carbon dioxide in the atmosphere theoretically [should increase plant growth](#). But don't expect climate change to feed the world. You are likely to have to change diets because bigger droughts, flash floods, heatwaves and storms may devastate harvests and reduce the amount of foods available. Countries such as Britain, which depend heavily on food grown abroad, may be able to grow fruit that farmers only ever dreamed about, but there will be less land on which to grow and imported grub will be much more expensive because other climate-affected countries will keep their smaller harvests for themselves. If coral reefs vanish there will be fewer fish in the sea and if the oceans continue to soak up CO2 they will become more acidic. That would be very, very bad, but the scientists say this won't impact heavily in the next few lifetimes.

5 Take a shower

[Don't take fresh water for granted](#). Longer droughts are likely to dry up large parts of southern and eastern England, and underground water supplies will be more stressed. We've always muddled through heatwaves and droughts, but as temperatures climb, a run of dry winters becomes more and more likely. So prepare for droughts not just

once a decade but perhaps every other year. Get used to yellow lawns, taking showers with chums and watering your garden with waste water.

6 Be charitable

Humanitarian groups such as Oxfam [expect many more food shortages and natural disasters](#) in countries where even a small shift in the rainfall pattern or increase in temperature is enough to reduce harvests and leave millions more hungry. Worst-case scenarios? A shift in the Asian monsoons is expected to reduce the amount of water in rivers coming off the Himalayas, and because this is needed for nearly a third of the world's population, there could be disastrous food shortages. Further drying out of the Sahel and African rangelands will force millions of people to move.

7 Get a spanner

Things are going to go wrong much more often, so expect mini-disasters. Cars, trains, roads, and buildings, flood barriers, drains, underground systems, reservoirs, power stations, ports and all are designed for existing temperatures, sea levels and rainfall, and [may be overwhelmed in future](#). Railway lines will buckle more easily, nuclear power stations will get flooded more easily, building cooling systems will be inadequate, flat roofs will leak more and concrete structures will be like ovens. Designers will have to rethink the way things are made.

8 Watch your health

Warmer winters mean fewer deaths among the old, but [far more heart and respiratory diseases in the hot summer nights](#). Even worse, the warmer, wetter conditions will encourage the fungal, algal, tick-and-mosquito-borne diseases we usually only see in the tropics: Dengue fever was detected in France and Croatia in 2010; West Nile virus and Rift valley fever have become common in the US; and a 4C increase in Britain probably means malaria-carrying mosquitoes, and ticks infected with Lyme disease. Equally possibly, the already crumbling system of urban drains is likely to be overwhelmed by extreme weather events, which will discharge pathogens into heavily used rivers and seas, possibly heralding the return of diseases such as typhus.

9 Don't get angry

Life in many of the world's cities is already nearly unbearable in some months. The [scorching urban nights](#) expected with climate change will be a recipe for social disorder, ill-health and mass grumpiness. If there are water and power cuts, as expected, then get ready for migrations out of urban areas to cooler countryside. Best advice? Stay out of town.

10 Prepare for the big burn

A 4C temperature rise doesn't sound much, but it is quite enough to [kill off trees, wildlife, garden plants, insects, and river life](#). On the positive side, we may get faster-

growing rainforests and enhanced plant growth, but many animals will not be able to adapt to higher temperatures. Don't expect to grow the same plants in your garden, or see the same trees in the parks. Change will be gradual, but profound.

Letter published recently in the DominionPost: (online version)

"Four Degrees of Global Warming: Australia in a hot world", is a new compilation of climate science literature. Professor Garnaud is the contributor who wrote the following quote.

"The downside to warmer winters on the eastern seaboard in 2100 is the prospect of "anarchy" in our region prompted by the dislocation of 250 million people from the Asia-Pacific, climate refugees who will need to be resettled in part in Australia.

.... The mass exodus from low-lying Bangladesh and coastal cities of China, Indonesia and India poses perhaps the biggest challenge for Australia, which could face a wave of climate refugees on a scale that would dwarf the current asylum seeker crisis."

New Zealand is even more desirable and vulnerable. The process will begin long before 2100.

When are we going to get into our thick heads that every time we hop into an aircraft, allow the building of yet more roads, mine more coal, look for more oil to burn, put off reforms of our fossil fuel-powered and methane emitting farming systems we contribute to the realisation of Professor Garnaud's forecast?

Anthony Maturin.

"Climate Change is Simple" <http://youtu.be/A7ktYbVwr90>

(If you can't view this video on your computer, don't worry, it will be shown again at Summer Gathering.)

From a comment on the above uTube video:

"And seriously. Science and reality don't care what your beliefs or your agenda is. 99.9% of the worlds glaciers aren't all melting because you think liberals just want to tax you; the atmosphere and oceans aren't listening to Al Gore, and heating up just to push an agenda; the oceans aren't becoming more acidic just because they don't like the Koch

Brothers oil cartel... Science is true whether you believe it or not; and unlike bias and political tittering, science WORKS (ask your computer)."

In the video David Roberts gives a brief overview of why the earth is warming; points out that the widely accepted - by politicians and some planners - 2degrees C is catastrophic for millions of people; is too dangerous to live with; impossible to achieve if we continue on our present track of emissions control. He talks about tipping points. And as more and more climate scientists are saying, we have around ten years grace to get serious emissions controls started. I would add that we all need to promote understanding of climate change and a sense of urgency [Ed.]

Lumsden School's Food-Forest (a first)

Submitted by [Lauren Hailes](#) on Mon, 26/08/2013 - 7:02pm
Sunday, August 25, 2013

[Lumsden Primary School's food-forest \(a first!\)](#)

Lumsden Primary School lost a sizable chunk of its playground this week, but in its place gained the country's first-ever school food-forest. Where for years and years only grass grew, there now grows a mixed 'orchard' of apple, pears, plum and peach trees, all planted by the pupils of the rural Southland school. Red and black currants along with cranberries, raspberries, feijoa and hazels fill the spaces between the fruit trees, and they in turn are underplanted with herbs; rosemary, sage, feverfew and other 'bits and bobs' brought from home gardens by the children, as a contribution toward the establishment of the school's food-forest.

It's a wonderful sight, now that the planting is done, the winding path through the food-forest finished and the trees and bushes pruned and waiting for the flush of spring growth. It was a cheering sight too, when the planting activity was in full-swing; parents and board of trustee members spading and forking to make the digging easier for the littlest children, older students guiding the new-entrants as to how arrange the roots of an apple tree to give it the best chance of success, members of the school's 'Green Team', bringing in bucket's-full of manure to line the bottom of each planting hole, the school's principal, trying unsuccessfully to keep his clean clothes and hands free of dirt, and the initiators of the project to transform the playground into a fresh-food-space, Robyn and Robert Guyton, directing operations like friendly policemen on traffic duty. It all went like clockwork, thanks to the combined efforts of all concerned. The enjoyment of the day was further helped by the perfect weather; warm and still, a typical Lumsden day we were assured.



The children talked a lot, mostly about the harvest they were looking forward to. One young boy made the observation that he'd not need to make his lunch at home any more, he could just come out to the food-forest and graze! They all agreed that the raspberries were going to be a popular item

amongst the browsing school pupils, and that the gooseberries would only appeal to the select few who professed to liking them already.

The forest-planters all finished the day by sowing handfuls of blue lupin and pinches of crimson clover seeds over the whole 100 square-metre 'orchard-garden', then holding a school assembly where the especially helpful children, along with contributing parents and teachers and the Guyton's, were thanked for their work in establishing the special feature of the school. It's planned that more planting between the trees will be done as the children discover other plants at home that could be transferred to school without upsetting their mums and dads, and that herbs started in the tunnelhouse beside the playground could find a place out in the food-forest as well. Then it's just a matter of waiting for autumn... Posted by Robert Guyton.

Leave coal in the ground to avoid climate catastrophe, UN tells industry

Intensity of UN climate chief Christina Figueres's remarks take coal industry leaders and environment groups by surprise

[John Vidal](#) and [Graham Readfearn](#) in Warsaw

[The Guardian](#), Monday 18 November 2013 19.51 GMT



The La Cygne coal-fired power plant in eastern Kansas. Photograph: Charlie Riedel/AP

Most of the world's [coal](#) reserves should be left in the ground to avoid catastrophic global warming, the UN's climate chief has told the \$3tn global industry.

In a speech to a gathering of industry executives, Christiana Figueres challenged the industry to urgently transform itself, diversify into renewable [energy](#) and "radically change ... rapidly and dramatically for everyone's sake".

"By now it should be abundantly clear that further capital expenditures on coal can go ahead only if they are compatible with the 2C limit", she said at the [international coal and climate summit in Warsaw](#), being held at the same time as UN climate talks.

Figueres said they had "the opportunity to be part of the worldwide climate solution" by switching off old coal power plants, capturing and storing carbon from new plants and leaving most of the world's coal reserves in the ground. She also said coal power could help poorer countries' economic development and poverty reduction, but that the industry "must change".

"I urge every coal company to honestly assess the financial risks of business as usual; anticipate increasing regulation, growing finance restrictions and diminishing public acceptance," she said.

Figueres was later backed by the energy minister, Greg Barker, who is in Warsaw for the UN negotiations. "Coal represents the biggest threat to climate stability in the medium term. If we can keep coal in the ground it could have a profound impact on the growth of the world economy. The question is how do we keep unabated coal in the ground," he said.

But Barker backed gas over renewables. "Gas is the way to ensure we burn less coal over the next two decades," he said.

At a later press conference, Figueres said the industry needed a "deep, deep transformation" and should reinvent itself as a developer of renewable energy.

"They really need to do a major, major rethink and a major shift in the deployment of their capital [towards renewable energy] ... there is no doubt they are the energies of the future," she said.

Her remarks took both the coal industry and environment groups by surprise. The industry had invited her to talk in expectation that she would legitimise their continuing growth if they adopted new technologies. The activists had been critical of her talking to the industry at all.

But it is thought Figueres was stung by insistent youth groups at the UN conference who reportedly admonished her for being prepared to talk to the coal industry but not to them. In a nod to their presence, she called on the industry to "see the next generation's bottom line".

The industry declined to respond directly but argued that significant emissions reductions could be achieved by improving the efficiency of coal-fired plants using "high efficiency" coal.

But this was rebutted by a group of 27 international scientists meeting in Warsaw who agreed with Figueres, saying that nearly 75% of the world's coal reserves had to be left in the ground if global warming was to be limited to a 2C rise.

In a joint statement, the scientists – from the US, Germany, Japan, China, India, Brazil and South Africa – rebutted claims that high-efficiency coal can be a low-emissions technology.

Using International Energy Agency estimates of world coal reserves, the group said that burning just 26% of the reserves would break the global "carbon budget", lifting temperatures above the 2C threshold which has been adopted as a goal for the UN climate talks.

"We are not saying there is no future for coal", said Professor PR Shukla of the Indian Institute of Management, "but that unabated coal combustion is not compatible with staying below the 2C limit."

Milton Catelin, chief executive of the World Coal Association, said: "We're not going to meet our climate objectives if we are not all part of the solution. Ms Figueres has shown she shares the WCA's view that multi-stakeholder dialogue is key to tackling [climate change](#)."

Martin Kaiser, Greenpeace's international climate director, welcomed the speech. "She gave the right warning to investors that any new investment into coal-fired power plants is a financial risk as there will be increasing regulation, growing finance restrictions and diminishing public acceptance."

IPCC report: Australia can expect 6C rise on hottest days

Reptile, bird and mammal species set to vanish along with Kakadu wetlands by end of century, scientists' report reveals

[Oliver Milman](#)

[theguardian.com](#), Friday 27 September 2013



Magpie geese in Kakadu. Rising sea levels will risk causing "extensive loss" of wetland habitat, the report will say. Photograph: Stephen van der Mark/AAP/PR image

[Australia](#) is expected to experience a 6C average temperature rise on its hottest days and lose many reptile, bird and mammal species as well as the renowned wetlands of Kakadu by the end of the century, the latest Intergovernmental Panel on [Climate Change](#) report reveals.

IPCC figures show that Australia will experience an average overall increase of 2C by 2065, with that figure slightly lower at the coast. Beyond that, the temperature is expected to rise another 3C-4C by 2100.

The number of days that don't fall below 20C is projected to rise to 100 a year, with most of these warmer days in the north and on the east coast.

Rainfall patterns are set to change, with annual precipitation, humidity and cloud cover predicted to decrease over most of Australia. But for north Australia and many

agricultural areas, rainfall is predicted to get heavier. Soil moisture will decrease, mostly in the south of the country.

These changes will have a significant impact on many aspects of life, according to the comprehensive report, which is released every six years after input from hundreds of scientists around the globe.

In Australia, an increase in the frequency and intensity of heatwaves is expected to lead to more heat-related deaths, while warmer temperatures, changing rainfall and an influx of pests will "negatively impact" many temperate crops, such as fruit and nuts.

Rising sea levels will affect coastal developments and risk causing "extensive loss" of wetland habitat through saltwater intrusion in the celebrated Kakadu national park in the [Northern Territory](#).

A 2C-4C rise in average temperatures will wipe out 21%-36% of Australia's butterflies, while the loss of nearly half of appropriate habitat in [Queensland](#) will spell doom for 7%-14% of reptiles, 8%-18% of frogs, one in 10 birds and 10%-15% of mammals.

Australia has warmed by 0.4C-1.25C since 1901, with most of the rise taking place in the centre of the country.

Globally, there has been a 0.89C rise in average temperatures since the start of the 20th century, [the IPCC findings state](#). There is now a 95% certainty that humans, through the burning of carbon intensive fuels, are responsible for most of the warming.

To keep average global temperature rises below 2C – the internationally agreed upper limit of warming – greenhouse gas emissions will need to be cut by 10% a year, according to the report.

In a statement released after a laborious process where the IPCC report was trawled over line by line by 110 nations, the UN body said governments had been handed a "firm mandate" to act on climate change.

"The report confirms that the planet is heating up, sea level rise is accelerating, the rate of Arctic Sea ice retreat has doubled, the melting of glaciers and ice sheets is happening faster, and the oceans are acidifying," it said.

"This report shows that the science on climate change is clear. The debate about who is responsible is over. People rightly demand that governments tackle the climate risk posed to our communities and economies."

Climate scientists in Australia involved in the report echoed these sentiments.

"In many ways the certainty of human influence can be 95% or 97%, it doesn't make any difference," Andy Pitman, a review editor of the IPCC report and director of the ARC Centre of Excellence for Climate System Science, told Guardian Australia.

"In what other decision-making process do you need certainty above 95%? This is way, way beyond the realms of doubt. There is no excuse for a lack of policy response. There may have been an argument around 1990, but not since 2001 and certainly not now."

The IPCC report is set to address the issue of a "warming pause" over the past 15 years, which has been seized upon by some climate change sceptics as evidence that warming has been exaggerated by erroneous modelling.

The plateau in temperature increase is to be attributed to a variety of factors, including an increase in aerosol use and the storage of more than 90% of accumulated heat in the deep oceans, rather than on the surface.

"There has been a double-dip La Niña, huge ocean uptake, a solar minimum and aerosol particles," Pitman said. "When those things aligned in the past, we see a three- or four-tenths of a degree of cooling. This time, it's plateauing – so the question is why didn't it cool back to the levels of 1990? That's a considerable concern.

"A number of papers say to expect decades of cooling against a long-term warming trend. The significance of climate change not capturing the last 15 years is the same as Usain Bolt swimming a slow 100m. It's utterly irrelevant."

Professor David Karoly, a fellow of Melbourne University and another reviewer of the report, told Guardian Australia that the human influence over warming was "now beyond reasonable doubt" and placed the onus on a greater response to cutting emissions.

"For the first time, the IPCC report will look at the role of the carbon budget and the cumulative effect of burning carbon that's linked to dangerous climate change," he said. "The longer we delay, the harder it is to avoid dangerous climate change."

The IPCC has set this "carbon budget" at 1 trillion tonnes of emissions, saying the world has already burned through half of this and will have exhausted the budget within 30 years if no further action is taken.

Nov 25, 2013

The world cannot afford to delay drastic emissions cuts, studies show

From [the Guardian](#) via Environmental Researchweb Newsletter

The world cannot afford to wait any longer to make drastic cuts in greenhouse gas emissions, two new studies have shown, as the United Nations climate change talks in Warsaw enter their final stage.

The research, published in the journal *Nature Climate Change*, shows that delaying reductions in carbon dioxide output would result in faster global warming, and therefore be more difficult to counteract in future years. This contradicts the arguments that some climate sceptics have put forward that drastic cuts can be delayed until future years, because of the current "pause" in global temperature increases, and the finding by the Intergovernmental Panel on Climate Change that the climate may be slightly less sensitive to the impact of rising carbon levels than the previous highest estimates.

The authors found that as carbon dioxide concentrations in the atmosphere accumulate over time, "what happens after they peak is as relevant for long-term warming as the size and timing of the peak itself", and this would imply "sustained emissions reductions are necessary if warming is to be kept below any agreed limit".

Myles Allen, professor of geosystem science at Oxford University, lead author of one of the studies, said: "Unless we assume the long-suffering taxpayers of the 2020s somehow manage to compensate for continued procrastination now, peak carbon dioxide induced warming is increasing at the same rate as emissions themselves – at almost 2% a year – which is much faster than the observed warming."

This means, he said, that further delay would be dangerous. "If we were aiming in 2010 to limit warming to 2C, a delay of only five years has already cost us two-tenths of a degree if we make the same effort starting in 2015. That is equal to the observed warming since the early 1990s."

The other study examined "short-lived climate pollutants" (SCLPs) such as methane and soot. Cutting these substances can reduce the immediate impact of warming, and there is a major international initiative under way to reduce the quantity of these into the environment. Substantial cuts could reduce projected warming by as much as 0.5C, according to some estimates, which has led some to suggest that we should concentrate on reductions in SCLPs while finding ways to reduce carbon in the future.

The paper, also led by Oxford University, found that SCLP emissions in any decade "only have a significant impact on peak temperature under circumstances in which carbon dioxide emissions are falling". This means that while swift action on SCLPs "might potentially buy time for adaptation [to the effects of climate change] by reducing near-term warming", over the longer term – that is, in more than a

decade's time – those reductions need to be accompanied by strong action on carbon emissions to continue to dampen down temperature rises.

David Frame, a co-author of the paper, of the Victoria University of Wellington, New Zealand, said: "We show that taking action today on emissions of these SLCPs will have relatively little impact on peak warming unless carbon dioxide emissions are reduced at the same time. So action on these other pollutants does not buy time to delay action on CO₂."

Fiona Harvey is an environment correspondent at *the Guardian*

