A TIME FOR CHANGE

HOW THE PARIS AGREEMENT COULD SHAPE THE FUTURE OF OUR CLIMATE

From 30th November to 12th December 2015, Paris, France, played host to the 2015 United Nations Climate Change Conference, otherwise known as COP 21. The conference saw the setting out of the Paris Agreement, which puts forward the ambitious goal of severely limiting global temperature rises, and therefore avoiding the more severe effects of climate change. The agreement follows 20 years of fraught and largely unsuccessful previous attempts to bind some 195 countries to a universal agreement such as has now been achieved.

Rachael Simpson

However, the agreement still has to be ratified, requiring nations responsible for more than 55% of emissions to formally sign up before the agreement can be made official, and enshrined in international law.

The agreement has been met with largely positive opinions, but there are those who feel that the agreement is overly ambitious, and cannot therefore be achieved. International Environmental Technology Editor Rachael Simpson spoke recently to Professor Andrew Pitman, Director of the ARC Centre of Excellence for Climate System Science, winner of the NSW Scientist of the Year Award, the Priestly Medal for Excellence in Atmospheric Science Research, and joint winner of the International Justice Prize for the Copenhagen Diagnosis (among many others), to find out his thoughts on the Paris Agreement, and whether or not he thinks it is enough to avoid significant climate change.

Q: For the sake of our readers, could you just give an introduction to your academic background, the fields that you specialise in, awards you've received and so on.

A: I'm a professor at the University of New South Wales in Sydney, Australia. I have been working in climate science since I finished my PhD in 1988. My particular speciality is modelling of the earth's climate with a particular focus on terrestrial processes – energy, water and carbon cycling between the atmosphere and the land, but also I'm interested in the impacts of land cover change on climate and the impact of a whole variety of things on extremes. I have a particular interest in climate change and how land use change influences these climate and climate extremes.

I've got about 190 international publications, a couple of books, I'm a fellow of the American Meteorological Society, and I've won several wonderful Australian awards for climate science and such like. I was a lead author on the 3rd and 4th assessment reports of the Intergovernmental Panel on Climate Change and a review editor on the 5th report.

Q: It was the COP21 talks back in December of 2015 – did you attend the talks?

A: No. Those talks are primarily very political – my area is in the hard-core science surrounding climate – working group 1 of the Intergovernmental Panel on Climate Change (IPCC) assessments, so my area of expertise is in that hard-core climate science – and I would run a mile from the opportunity to actually be at these talks!

Q: But as a climate scientist I'm sure you'll have heard what the historic COP21 agreement entails.

A: Oh absolutely.

Q: The COP21 agreement aims to hold global temperature "to well below 2c above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5c above pre-industrial levels". Can we still expect to see climate impacts as a result of this limited rise? And if so, what impacts?

A: We are already observing substantial changes in climate due to emissions to date. We're seeing quite impressive changes in a range of climate extremes around the world, and that with global warming of 0.9 degrees celcius to date, so we are virtually doubling warming to date to get to 1.5. The thought that 1.5 is somehow safe is simply incompatible with the observations. However, 1.5 degrees is a shocking amount safer than 2 degrees, so what Paris did was set us on a trajectory. That was helpful, but it's certainly by no means a solution and by no means the end of the story. If we warm by 2 degrees, and I'm willing to bet a case of very expensive champagne that we will, we are going to see amplification of a whole range of extreme events. Whether we see any massive changes associated with tipping points is impossible to say with any certainty. The risks are already there, and as we go to our 1.5 or 2 degrees the risk of tipping is obviously amplified substantially. Paris is a success story because it has been accepted that we should limit warming to 2 degrees and should ideally aim for 1.5 degrees. Unfortunately I think limiting warming to 1.5 is of very low probability, and perhaps has therefore identified some naivety in the understanding of some of the science by decision makers.

Q: You were the lead author of The Intergovernmental Panel on Climate Change (IPCC) assessment reports 3 and 4, and contributed to the awarding of the Nobel Peace Prize to the IPCC in 2007. The work also came under fire for having some factual errors (such as the projected date of melting of Himalayan glaciers). Why do you think that research presented on climate change attracts such criticism from sceptics, as opposed to other areas of science?

A: Well I think there are actually a number of things that are picked on – go and look at some of the blogs on inoculating kids; that's picked upon because there is a whole group people that think it's a bad idea, and campaign online about how dangerous it is… There are a number of areas from genetically modified foods through to nanoparticles in plastics that some groups get terrifically worried about. Power lines, ultrasound coming from wind farms – none of this is evidence based. The attacks on climate science aren't evidence based in the majority of cases, and I think that where it comes from is twofold.

One is that there are a suite of companies that recognise that the dominant issues surrounding climate change would destroy their current business model. I think some of them have to be inclined to transition to alternative business models where they have long-term viability. That happened around the Montreal Protocol and CFC's – a number of major chemical companies denied the problems with the ozone hole for a very long time, surprisingly till they had an alternative and then they said "Look, it's a real problem but hey – we have an alternative". And so there are people who are profiting from the case saying climate science is wrong as part of a well-defined strategy to buy time to allow a company to adjust. This is a pretty dangerous strategy – at least one major oil company is currently being investigated in the US around what it knew about climate change decades ago and whether they have been intentionally misleading the public.

There's a second group of people who don't like climate change because they perceive it to be an infringement upon their right to do whatever they personally want to do, irrespective of whether or not what they want to do will ultimately cause massive environmental challenges for the planet. As climate change has become a bigger and bigger issue it has attracted more and more groups out of the woodwork to attack the basic science. Not very well, on the whole, but they have done a stunningly good job of confusing the public. There is a fantastic book on all of this by Naomi Oreskes called Merchants of Doubt, and it's a book I would highly recommend to anybody who wants to really understand that continuation from the denialist movement in the tobacco industry, through to the denialist movement saying DDT was good for you, through to the denialist movement saying there was no such thing as ozone depletion, through to the denialist movement on things like global warming.

Q: Looking at another of the IPCC reports, it was stated in the 2014 assessment report that the IPCC are "95 percent certain that humans are the main cause of current global warming" – why are humans causing such a problem with climate change and global warming?

A: So first of all it's really important to understand what that "95 percent" statement means. There is zero doubt that humans are a substantial cause, and the use of language "95 percent sure that humans are the main cause" represents this. In fact humans have caused somewhere between 80 – 120 per cent of the warming to date and that might sound a strange statement – how can it be more

than 100 per cent, and that's of course because humans produce rather a lot of aerosols, which cool the planet, masking some of the warming that would otherwise have occurred through the emission of greenhouse gases. But the major driver of the change in climate are the emissions of greenhouse gases - methane, nitrous oxide, CFC's - which are still emitted to some degree. This burning of stuff containing carbon in an atmosphere rich in oxygen, gives you CO_2 and that's basically the main driver behind climate change.

Q: A lot of your work is based on regional and global climate modelling at the ARC Centre of Excellence for Climate System Science. Can you give a bit of the history behind the ARC Centre, what this modelling consists of, and how it helps provide an accurate picture of future climate change?

A: The ARC Centre of Excellence for Climate System Science was established in 2011, we are funded by the Australian Research Council, which is analogous for the National Environmental Research Council (NERC) in the UK. We are quite large by Australian standards and quite small by US or European standards. We are the premier group of climate scientists working in the university sector in Australia, and we collaborate with the major research groups in Australia, but we also collaborate with some other groups from around the world ranging from NASA to the Met Office to groups in France and Germany. We are very connected to analogous groups around the world as you would expect given one of our primary objectives is improving climate models.

We don't actually build climate models any more. Climate models are more than a million lines of computer code and take decades to develop with hundreds of people. They are phenomenally complex pieces of software. What we do is pick the pieces – for instance, how clouds are represented or how the oceans are represented and we collaborate and work with groups around the world to improve these models, develop new theories, new ways to solve the mathematics and the physics of those systems, and look at computer developments taking place around the world.

Q: Hans Joachim Schellnhuber, head of Potsdam Institute for Climate Impact Research, recently stated that achieving the COP agreement will require the deployment of Carbon Capture & Storage (CCS) technologies to suck carbon out of the atmosphere. However, the UK government cancelled its £1bn competition for CCS technology just six months before it was due to be awarded. In your opinion, are CCS technologies the way forward?

A: The most important thing to understand, as it relates to climate change, is that there is no silver bullet. Anyone who ever says "Ah, well I've got the solution" is a snake-oil salesman – there is no single silver bullet. Most issues around carbon capture and storage suggest that the capability to roll out something of sufficient scale to make much of a difference is way beyond anything that is currently envisaged. There is no doubt whatsoever that in certain locations, certain places, you can pump carbon dioxide down deep into the geology and expect it to stay there, but the number of places where that will work well, and in a way that will be cost effective, are quite few and far between.

There are some experimental plants that exist and that work well, but as far as I know no one has really comprehended how to scale that up. You currently have a species that is emitting 10 billion tonnes of CO_2 per year. Now, it's hard to imagine what 10 billion tonnes is, but 1 billion tonnes is very approximately a cubic kilometre of coal being vapourised annually. When you start to imagine what a cubic kilometre of coal looks like, and you know that you've got lots of them, and you begin to think about how you could somehow capture that CO_2 and somehow pump it deep under the earth and leave it there for a millennia, you begin to get a sense of the scale of the problem.

So, carbon capture and storage does need to be encouraged, does need to be examined, and does need to be looked at as part of the solution, but I'm very wary when people start thinking of it as a proven technology, a technology that can be rolled out, or a technology that's beyond the experimental stage.

Q: So are there any technologies that are ready to roll out or have been proven to work? If CCS is a possibility, but not the likely hero, do you think there are one or two other things that could be used?

A: That's the wrong way to think about it in my view. The right way to think about it is that everything we do that emits CO_2 or methane or nitrous oxide needs to be examined, whether that would be more efficient vehicles or more efficient heating, better insulation etc. You need to have a whole of system approach towards using energy much more effectively, investing very substantially, as has happened, with renewables, and putting a price on emissions of greenhouse gases, because there is a cost to emitting CO_2 into the atmosphere which is not usually taken into account. Under those circumstances, looking at renewables integrated with existing technologies, baseloads sourced from gas and maybe nuclear in some regions, will create a much broader and much better implemented and integrated renewables sector. If you go those ways quite aggressively we might have a shot at limiting the rise to 2 degrees.

Q: Do you think it is too late to reverse what we have done to the climate, and has the COP21 agreement taken too long in the making to cause positive change? There are a lot of people who have been saying that this agreement should have been made 10 years ago. Looking towards the future, are things a bit bleak?

A: The science was clear in 1990, and in 1990 the scientists were saying that we needed to deeply cut CO_2 emissions. I'll have to check the data but I think we were emitting about 2 billion tonnes a year back then. Had we cut from 2 billion, and not expanded to 10 billion, and we had cut in 1990 from 2 billion, not increased over the next 25 years to 10 billion, we would be in much less of a hole. As it is, though, the problem is much harder and therefore more exciting to look at how we might solve it.

My personal view is that it's too late to avoid to 2 degrees. However, that isn't a negative statement, and that isn't me saying throw up your hands and run away screaming. If you can't avoid 2 degrees, then aim for 2.5. And if you can't avoid 2.5 then work really really hard to avoid 3. The COP Agreement, in Paris, does set us on a trajectory which turns around the accelerating rate of emissions in a very solid way. This is the first step, the equivalent of the Wright brother's aeroplane flight. I'm not at all sure that the Wright brothers ever imagined 747's when they built their aeroplane. Similarly, the people negotiating the agreement in Paris probably can't comprehend the scale of negotiation and technological advances that are going to have to take place to avoid 2.5 or 3 degrees of warming. But they are the equivalent of the Wright brothers if you like – they have started a process and I hope it's like dominos. That the first domino and the second domino have now been knocked over by COP, and it's going to move through processes and become unstoppable in terms of technological and engineering innovations which will, in the end, avoid global temperature rises such as 3 degrees which really are untenable and unacceptable.

Q: It's really easy for a single person, an individual, to look at the state of the climate, to look in the direction we are heading with warming, and to think "It's too late – what can I do, I am only one person?" For people such as our readers, what advice can you give about how to limit their impact on the climate?

A: My usual answer for that is to get familiar enough with the science and your carbon footprint to be able to do something about your carbon footprint, and to personally commit to reducing the emissions you're responsible for. Also, to actively communicate with the decision makers, with the policy makers in your workplace, to the company board, to anyone who'll listen. Those companies who are in denial about climate change are going to be less understanding, so you've got to figure out how you'll be one of the leaders. You'll need to take advantage of climate change for your business, and not be one of those who is hammered by what happens because you're being passive.

Now your readers are much more educated and informed than normal, so for them I'd simply say to review what they're personally doing, both in a carbon footprint sense, and in how you're communicating with others on climate change in your workplace and social circle, to make sure you minimise your vulnerability and maximise your resilience to climate change over the next one to ten years. I'm not at all clear how an individual affects large scale political decision making but we all know of people who have managed to do so. If one of your readers thinks they have a way to influence the decision making process then I would hope they are already doing it.

Professor Andrew Pitman

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