

It's easy to feel downbeat about climate change. But as climate scientist **Mark Maslin** told a recent *New Scientist* online event, there's so much governments, companies and all of us can do – and now is the time to do it

# Climate change? Yes, we can.



**I**T MIGHT seem bizarre that I'm talking about climate change when we're all faced with a huge pandemic. But many of us believe that the bigger threat facing us is climate change. What I want to show is that by dealing with the impact of this pandemic, we can also deal with climate change. We can have win-win solutions.

The first thing to realise is that climate change science is really old. In 1856, the US scientist and feminist Eunice Foot took two glass tubes, put  $\text{CO}_2$  in one and normal air in the other, stuck a thermometer in each and left them out in the sunshine. She saw the one with  $\text{CO}_2$  heated up quicker, got hotter and stayed warmer for longer. It wasn't much later that in London John Tyndall measured the "radiation effect", the actual effect of heat absorption by gases in Earth's atmosphere.

Just imagine you're not in lockdown, but on a tropical beach. You feel hot. Sunlight hits your skin and converts to heat. That's exactly what happens to Earth. As it radiates the sun's energy back into space as heat, greenhouse gases grab some of it, hold on to it for a while, and then release back it into the atmosphere. If you took all the greenhouse gases out of our atmosphere, the temperature would drop

by 35 degrees. The English winter would be about minus 30 Celsius, and the English summer, if you're being generous, would be about minus 15. In that sense, greenhouse gases are a good thing.

But in 1938, the researcher Guy Callendar looked at data from 147 weather stations around the world. He saw that the planet's temperature was rising, and was able to link that to increased  $\text{CO}_2$  due to industrial processes. The famous Keeling Curve, which measures  $\text{CO}_2$  in the atmosphere from Mauna Loa on Hawaii, shows the trend since (see diagram, below). It goes up and down every year with the seasons, but it just keeps on going up. It's peaked so far in 2020 at 417 parts per million. That's an increase of 45 per cent since the industrial revolution, and the highest level for at least the past 3 million years. We know that thanks to beautiful records from ice cores drilled from Antarctica and Greenland, which have ancient air trapped in them. You can measure how much  $\text{CO}_2$  and methane is in there, and it goes up and down beautifully with the ice ages – until the past 150 years.

And we're seeing the effects. In the Arctic, we have half the amount of summer sea ice

that we did 40 years ago. Sea level is now 24 centimetres higher than before the industrial revolution, and the increase is accelerating. If you put data from NASA, the US National Oceanic and Atmospheric Administration and the UK Met Office together, they all show the same trend: 2016 is the warmest year on record, and 2019 the second. Even now, we think there is a 70 to 80 per cent chance that 2020 will be the warmest year yet. Check back in December to see if we were right.

## There's only one Earth

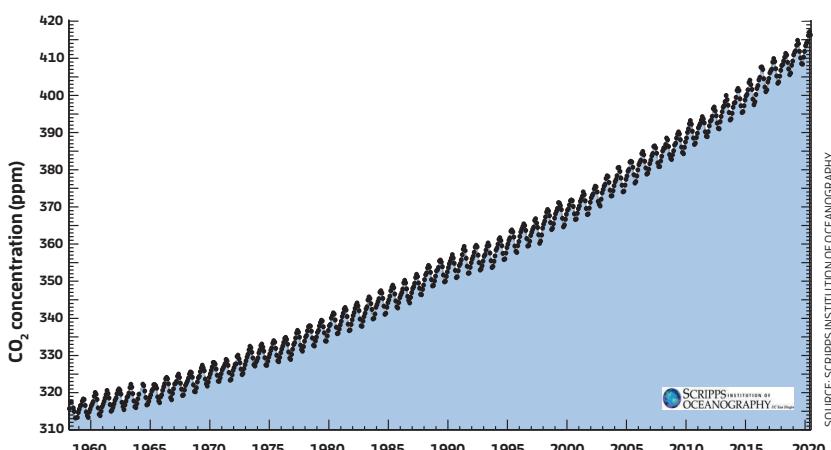
What about the future? As a scientist, I want lots of Earths to experiment with, so I can change one thing, see what happens, then change another and see what happens. But we only have one Earth, so we have to cheat. We build computer models to run multiple experiments on Earth's climate, so we can look at what the future is going to look like under different scenarios. And you see that if we have no climate policies, that gives you 4 to 5.5 °C of warming by 2100; if we continue with current policies, it's 3.1 to 3.7 °C; and if we follow the pledges made at the 2015 Paris climate negotiations, we could keep it down to 2.6 to 3.1 °C. And then there two other magical, aspirational pathways to keep the temperature rise down to 2 °C or 1.5 °C.

We can also look at specific questions like how often we will have summer heatwaves like the ones we experienced in 2003 and 2018 under these different scenarios. The 2003 heatwave was the worst to have hit Europe so far, with about 70,000 excess deaths in northern Europe. If you look at French death rates over the past 20 years, you see two noticeable peaks: one in 2020 for covid-19 and one in 2003. The excess deaths were about the same, with the peak higher in the heatwave, but less broad over time.

Will this become the new normal here in the UK? We can look at the summer of 2018, which was a truly global heatwave. We get the answer, on 1.5 °C pathway, one in four summers will be like that here; 2 °C, it's every other year; 3 °C, it will be nine in every 10 years. On top of that, there might be seasonal heatwaves as well. The winters in the UK are going to be warmer and wetter, ➤

## Onwards and upwards

The Keeling curve measures the concentration of  $\text{CO}_2$  in Earth's atmosphere – and it's been bending upwards ever since records began



# Your climate questions answered

Mark Maslin also took questions from audience members after his talk. Here's a selection of the best

too, and rain will fall in more intense bursts, increasing flood risk particularly in big cities along the coasts – London, for example. There'll be more unexpected, short, sharp cold snaps, again with more flood risk when snows melt.

Similar things will probably happen in places where you wouldn't expect them from past climate. At the moment, 825 million people go to bed hungry every night, and over a billion people don't have a constant supply of fresh, safe water. Food and water insecurity could get worse with climate change, hence why many experts talk about possible increased migration and conflict.

But none of this is a given. The Paris Agreement was a landmark. It basically says that the whole world, 193 countries, will cut greenhouse emissions as close to zero as we can in the 21st century. If we want to keep the temperature rise to that aspiration of 1.5 °C, that's technically feasible, too, but we first need to cut global CO<sub>2</sub> emissions down to zero by 2050. What is rarely mentioned is we then have to suck CO<sub>2</sub> from the atmosphere, creating negative global emissions. How much depends on how fast we get to net zero.

Hasn't covid-19 helped us – hasn't stopping 100,000 flights a day, not using cars and so on made a big impact? Well, yes and no. The drop in daily emissions was quite large, about 17 per cent in April alone. But over all of 2020, we are looking at maybe a 4 to 7 per cent drop, meaning the same emissions in 2020 as in 2006. That's not going to save us, and we know from the financial crash in 2008 that the rebound effect is very quick.

This pandemic has taught us something: that even though all round the world, we weren't flying, we weren't travelling into work, we weren't using our cars, emissions were still incredibly high. That's because most of global emissions are due to energy production – what's powering your computer and my laptop to be able to give this talk.

So what can we do? I'll start with governments, because one thing we've rediscovered in this crisis is that it's governments, not companies, that look after us in a crisis. They can support renewable energy, that's a no-brainer, tax fossil fuels and cut fossil-fuel subsidies. The International Monetary Fund suggests that around the world every year, taking into account climate change damage, fossil-fuel subsidies are

## HOW CAN WE AVOID AN EXPLOSION OF GREENHOUSE GASES AS LOCKDOWNS END?

The International Energy Agency and International Monetary Fund just published a report saying this is the point where we have to make choices. And because emissions have already dropped, if we can keep them lower we're already on the route to net-zero carbon. The key thing is for governments to take the lead in the post-covid recovery, to incentivise companies and us as individuals to produce less emissions. The key is energy production. If we can shift it away from fossil fuels everywhere, and more towards wind, solar and tidal, then we can start shifting the whole thing.

## HOW CAN WE EXTRACT CO<sub>2</sub> FROM THE ATMOSPHERE?

We have these amazing plants called trees that suck huge amounts of carbon dioxide from the atmosphere. We have cut down 3 trillion trees since the beginning of agriculture about 10,000 years ago, half of the trees on the planet. So we know that we can rewind and replant forests all over the world – and it's not as difficult as we think. Even though Earth's population is increasing, and will probably only stabilise at about

10 billion people in around 2050, people are moving to the cities, so we actually have more wild places where we can plant forests. If we start now, we have 30 years to plant more and more trees so that sucking CO<sub>2</sub> out of the atmosphere occurs in the second half of the century.

## DOES NUCLEAR POWER HAVE ANY PLACE IN ALL THIS?

If you happen to be a country that already has nuclear power, that's brilliant, it gives you a low carbon footprint while it's operating. But it actually has quite a large lifetime carbon footprint when you consider factors such as building the plants and storing nuclear waste. Meanwhile renewable energy has improved so much that it is much cheaper than nuclear. When I started giving these sorts of talks, solar panels were 10 per cent efficient at converting sunlight to energy. Now they're nearly at 25 per cent. A leaf on a tree is at 1 per cent. We're nearly 25 times better at this now than trees are.

## HOW CAN WE CRYSTALLISE IMMEDIATE CLIMATE ACTION?

I think what we have failed to do is provide this positive vision of the future. So often, climate change deniers have tried to paint climate action as if we're all going to go

back and live in tents back in the wilds. That's not true. We're going to use technology to make sure that the world is a much better place. We're looking at 2050 as a time when there are 10 billion people on the planet, we've stabilised the climates, and we've actually allowed nature to grow back. Pandemics, whether it's SARS, MERS, bird flu or now coronavirus, have come about because we did not respect the boundary between nature and humans. This is the moment to re-evaluate our relationship with nature.

## DO YOU REALLY THINK ACTION CAN SUCCEED?

The really exciting thing is that our children are a completely different species. They can interact with social media, they have no idea of a world without Google, they are really good at sifting through information and understanding what they trust and who share their values. For me, the new generation coming through gets the science, understands there can be a brilliant future, and knows we've got the technology to make it happen. They love technology. As long as we leave them a world in which we have already taken meaningful action to deal with climate change, they can build upon it and I think we're going to be sorted.

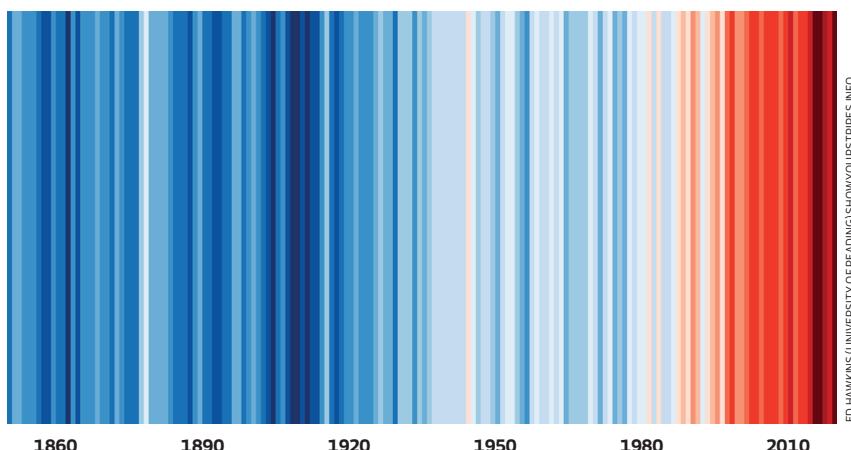
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## Showing the stripes

Climate scientist Ed Hawkins's graphical representation of the increase in average global temperatures as a result of rising CO<sub>2</sub> levels has become an unlikely fashion icon



about \$5 trillion a year, twice the UK's GDP.

We can support electric cars and the move to public transport, and also build and support carbon neutral buildings and retrofit existing buildings. We can rewild, plant lots of trees and make sure wetlands are safe and expand, so we can pull lots of CO<sub>2</sub> out of the atmosphere and make getting to net zero much easier. We can promote low emission farming and diets, and support and expand the emission trading schemes that are burgeoning around the world.

People also don't realise how much the green economy is worth. It's easy to say how much oil is produced, and how much money that makes, but because the green economy is so dispersed, it's very difficult to do. Lucien Georges, a brilliant PhD student of mine now at the University of Oxford, worked out that the global green economy is worth about \$10 trillion per year. That's four times UK GDP, and it's growing at 10 per cent a year. If Donald Trump wanted to become the greatest jobs president ever, he should have been investing in the green economy.

As for companies themselves, they too can switch to 100 per cent renewable energy, use carbon neutral buildings, retrofit buildings, and offset emissions through reforestation and rewilding, and make sure their supply chains do too. Most importantly, they can lobby governments to support the change

## “The battle against climate change will be won or lost with the post-covid-19 recovery”

they actually want. Being sustainable and actively caring about the environment turns out to be good for business: the Carbon Disclosure Project shows that companies reporting their carbon impact get a 67 per cent higher return than companies that refuse to.

We can also drive all this through individual climate actions, and act how we want companies and governments to. The first thing is talking. Climate change is the greatest threat to humanity, we can't say, let's not talk about it, it's a bit too scary, it's not nice. We should be screaming about this on social media, and talking about how we are going to actually save our planet for ourselves.

How? Well, we can switch to a more vegetarian or vegan diet. That improves our health and our children's health, and at the same time massively reduces our food carbon footprint – a real win-win. We can

switch to a renewable energy supply at home, and so send a message to energy suppliers that we only want renewable energy. We can reduce waste, reuse, recycle more – we all know the mantra. If you don't need a car, cycle or use public transport – wearing a face mask, of course. If you need a car, then guess what, have electric or hybrid one. Stop flying, or if you must because, offset your emissions.

In fact, offset your unavoidable emissions at 10 times the amount, just to make sure they are covered. If you have a pension plan, make sure your pension company divests from fossil fuels. If they don't, move your pension. If you are lucky enough to have investments, invest in things that are going to make a bigger profit: the green economy.

And protest. The world has been changed by young people. Schoolchildren have decided to take a Friday off every month and go and protest, and it's been incredible. Something like four and a half million young people protested on one Friday to show that they thought that adults have mucked it up and it really should be sorted out before they are adults. And voting, voting: if you're lucky enough to be in a democratic country, that is a powerful tool to say, I'm sorry, we want you to deal with climate change.

For me, the battle against climate change will be won or lost with the post-covid-19 recovery. Governments have started to lend companies a huge amount of money. Some are saying, you can have this money only if you do X, Y and Z to reduce your carbon footprint. So let's do all this and more. There are so many great ideas out there. We can rebuild our economies to be more resilient against the second and third waves of covid-19, and against future pandemics – and while we do, we can sort out climate change, too. ■



**Mark Maslin** is professor of climatology at University College London and author of books including *Climate Change: A Very Short Introduction* and *The Human Planet: How we created the Anthropocene* with Simon Lewis. This is an edited version of a talk he gave at a New Scientist online event on 18 June 2020